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Volume III - Power Spectral Density Plots

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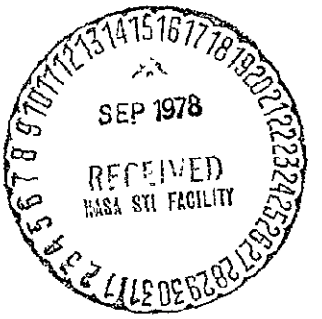

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F-15 Inlet/Engine Test Techniques and Distortion Methodologies Studies

Volume III - Power Spectral Density Plots

C.H. Stevens
E.D. Spong
M.S. Hammock

McDonnell Douglas Corporation
McDonnell Aircraft Company
St. Louis, Missouri

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16 Abstract

The Power Spectral Density plots contained in this volume of the F-15 Inlet/Engine Test Techniques and Distortion Methodologies Study were used in accomplishing the primary study goal of determining if peak distortion data taken from a subscale inlet model can be used to predict peak distortion levels for a full scale flight test vehicle. The results of this study are contained in the Technical Discussion, Volume I (NASA CR 144866).

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FOREWORD

This report was prepared by the McDonnell Aircraft Company (MCAIR), a division of the McDonnell Douglas Corporation, St. Louis, Missouri for the National Aeronautics and Space Administration, Dryden Flight Research Center, Edwards, California. The study was performed under NASA Contract NAS4-2364, "F-15 Inlet/Engine Test Techniques and Distortion Methodologies Study." The work was performed from March 1977 through February 1978 with Mr. Jack Nugent (NASA/Dryden) as Program Monitor and Mr. Harvey Neumann (NASA/Lewis) as Technical Monitor. Special acknowledgement is due Mr. T. Putnam (NASA/Dryden) for his constructive criticisms and suggestions.

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Significant subcontract support was provided by Mr. Wayne Walter and Mr. Lew Hayward of Pratt & Whitney Aircraft (P&WA), Government Products Division, under the direction of Mr. Frank Thompson.

This report consists of nine volumes. Technical discussions of the program, results and Appendices A and B are presented in Volume I (NASA CR 144866). Appendices C through J are presented in Volume II through IX (NASA CR 144867-144874) which present the distortion analysis plots and the associated statistical functions used for the analyses.

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SYMBOLS

	Description	Units
ALPHA	Aircraft angle of attack	degrees
ALT	Altitude	meters (feet)
AVG	Average.	
b, B	Radial Distortion Weighting factor	
BYPASS	Inlet bypass area.	sq. meters (sq. inches)
Beta	Aircraft angle of sideslip	degrees
CIVV	Compressor Inlet (Fan) Variable Vanes . . .	degrees
Deg	Degree	degree
ΔP_{t_2}	Fluctuating component of individual probe pressure at the engine face	
$(\Delta P_{t_2})_{rms}$	Root mean square of fluctuating pressure . .	kPa (PSIA)
DELTA3	Inlet third ramp angle relative to the Inlet Reference Line	degrees
$\Delta P_{t_{2.5H}}$	Fluctuating component of fan exit total pressure/engine stream	kPa (PSIA)
$\Delta P_{t_{2.5C}}$	Fluctuating component of fan exit total pressure/fan stream	kPa (PSIA)
$\frac{\Delta P}{P}$, D_2	Spatial Distortion = $[(P_{t_2})_{max} - (P_{t_2})_{min}]/\bar{P}_{t_2}$	
FLT, FLIGHT	Flight test data notation	
FSCP	Full Scale Cold Pipe (without engine) wind tunnel test data notation	
FSE	Full Scale with Engine wind tunnel test data notation	
HZ	Hertz.	hertz
I.D., IDENT	Identification	
K_{a_2}, KA2	Fan distortion descriptor = $K_\theta + b\, K_{r_{a_2}}$ . .	
K_θ, KTHETA	Circumferential distortion	
$K_{r_{a_2}}$, KRA2	Radial distortion.	

SYMBOLS (Continued)

	Description	Units
BKRA2	Radial distortion multiplied by radial distortion weighting factor.	
KC2	High compressor distortion descriptor. . . .	
KθSP	Circumferential distortion descriptor used to calculate the high compressor distortion descriptor.	
kPa	Pressure, Killopascals	Killopascals
M_o	Freestream Mach number	
MACH	Freestream Mach number	
MAX	Maximum.	
MIN	Minimum.	
No.	Number	
P_{t_2}	Individual probe engine face steady state pressure	kPa (PSIA)
$\overline{P_{t_2}}$	48 probe averaged engine face steady state pressure	kPa (PSIA)
$\overline{P}_{t_{25H}}$	Average high compressor face steady state pressure	kPa (PSIA)
P_{t_o}	Freestream total pressure.	kPa (PSIA)
PT2I	Individual probe time variant engine face pressure	kPa (PSIA)
$\overline{PT2I}$, $\overline{PI}$	48 probe averaged time variant engine face pressure	kPa (PSIA)
PI/PS	Ratio of time variant to steady state 48 probe averaged engine face pressure . . .	
PSIA	Pressure (Pounds per Square Inch Absolute) .	PSIA
Q, q	Dynamic pressure	kPa (PSIA)
Re. No.	Reynolds number	
RHO	Inlet first ramp angle relative to the Inlet Reference Line	degrees
RMS, rms	Root mean square	
Sec	Second	second

SYMBOLS (Continued)

	Description	Units
Series VII	1/6th scale inlet wind tunnel test series data notation.	
Series VIII	1/6th scale inlet wind tunnel test series data notation	
T_{t_2}	Engine face total temperature	°K
$T_{t_{25H}}$	High compressor inlet (or fan exit) total temperature.	°K
Tu	Turbulence	
W2	Engine/Fan airflow	kg/sec (LB/sec)
WAT2	Corrected fan airflow = $W2\sqrt{\theta_{t_2}}/\delta_{t_2}$	kg/sec (LB/sec)
WAT2 Design	Design corrected fan airflow	98.43 kg/sec (217 LB/sec)
WAT2 Percent	WAT2 divided by WAT2 Design x 100	
W25H	High compressor airflow	kg/sec (LB/sec)
WAT25H	Corrected high compressor airflow $W25H\sqrt{\theta_{t_{25H}}}/\delta_{t_{25H}}$	kg/sec (LB/sec)
WAT25H Design	Design corrected high compressor airflow . .	24.69 kg/sec (54.44 LB/sec)
WAT25H Percent	WAT25H divided by WAT25H Design x 100. . . .	
α	Aircraft angle of attack	degrees
β	Aircraft angle of sideslip	degrees
Δ_3	Inlet third ramp angle relative to the Inlet Reference Line	degrees
δ_{t_2}	Corrected average engine face total pressure $\overline{P_{t_2}}/101$	
$\delta_{t_{25H}}$	Corrected average engine face total pressure $\overline{P_{t_{25H}}}/101$	
ρ	Inlet first ramp angle relative to the Inlet Reference Line	degrees
σ	Standard deviation of the instantaneous pressure	kPa (PSIA)

SYMBOLS (Concluded)

	Description	Units
$\sigma_{xy}(\tau)$	Covariance of pressure data from probes x and y at lag time τ	kPa (PSIA)
$\sigma_{xy}(\tau=0)$	Covariance of pressure data from probes x and y at lag time $\tau=0$	kPa (PSIA)
θ_{t_2}	Corrected average engine face total temperature $T_{t_2}/288.15$	
$\theta_{t_{25H}}$	Corrected average high compressor face total temperature $T_{t_{25H}}/288.15$	

SUMMARY

Recent emphasis on increased maneuverability requirements for fighter aircraft has necessitated an extensive engineering development effort be directed towards inlet/engine compatibility. Inlet/engine compatibility must be assessed early in the aircraft development program to allow necessary inlet and engine design modifications to be defined and implemented at minimum cost impact. This early assessment of inlet/engine compatibility is determined by engine stability audits computed using inlet distortion levels from subscale inlet model data and engine sensitivities to inlet distortion. Therefore, the accuracy with which subscale inlet model distortion levels predict flight test vehicle distortion levels is a crucial element in assessing inlet/engine compatibility.

The primary goal of this distortion methodologies study was to determine if time variant distortion data taken from a subscale inlet model can predict peak distortion levels for a full scale flight test vehicle. The data base used to accomplish this goal was collected in separate programs by MCAIR and NASA/Dryden. Subscale and full scale wind tunnel data were collected by MCAIR during the F-15 development program, and flight test data were collected by NASA/Dryden during the NASA F-15 inlet/engine compatibility flight test program. This data base has a Mach number range of 0.4 to 2.5 and an angle of attack range from -10 degrees to +12 degrees.

The primary objectives accomplished in meeting the overall program goal were to determine the effects on peak distortion of: (1) Reynolds Number/scale, (2) engine presence and (3) frequency content. In addition, the capability of the P&WA stability audit system to predict engine stalls was evaluated, and the capability of Melick's procedure, Reference (1), to predict peak time variant distortion levels was evaluated. Using the Pratt and Whitney Aircraft distortion descriptor, K_{a_2}, the data indicate the following significant results for the F-15/F100 inlet/engine propulsion system.

- Peak time variant distortion from subscale inlet model wind tunnel tests are representative of full scale flight test distortion.
- The time variant pressure data of this study are random stationary data, thereby allowing valid statistical analyses to be conducted.
- The effect of the engine presence on total pressure recovery, peak time variant distortion and turbulence level is small but favorable.
- The Reynolds number/scale evaluation indicates a general trend of increasing total pressure recovery, decreasing peak time variant fan distortion and decreasing turbulence with increasing Reynolds number/scale.
- The frequency content evaluation indicates that peak time variant fan distortion and turbulence increase with increasing filter cutoff frequency for all of the data evaluated in this study.
- The capability of the Pratt & Whitney Aircraft stability audit system to predict engine stalls has been verified for both stall and non-stall flight test conditions.

- Predictions of peak distortion values using Melick's procedure are accurate to 11.3 percent average error for fourteen data points having nominal turbulence levels and are accurate to 20 percent average error (the maximum error approaches 40 percent) for eight data points having high turbulence levels.

APPENDIX D

POWER SPECTRAL DENSITY PLOTS

Prèsented herein are the power spectral density (PSD) plots used in the frequency content analysis. Each plot contains the necessary information to evaluate the standardized error for each PSD plot. In general, the standardized error is approximately 10 percent for the wind tunnel PSD plots and approximately 50 percent for the flight test PSD plots. The 50 percent standard error for the flight test data is a result of the short analysis times, and this standardized error results in data variance which can be seen in the high frequency spectrum of the PSD plots.

The root mean square value of the fluctuating pressure components is presented on each plot. These values are obtained by integrating the Power Spectral Density function for the mean square value across the frequency range of the PSD.

SUMMARY OF HIGH RESPONSE PROBES INVESTIGATED FOR
POWER SPECTRAL DENSITY PLOTS

FIGURE NUMBER	DATA POINT IDENT NO.	*PART-POINT	MODEL SCALE	PROBES ANALYZED			
				MAX TU	AVG TU	MIN TU	OTHER
1	5	164-1	1/6th	L5R2	L8R6	L3R2	L3R3
2	6	164-3	1/6th	L8R3	L7R6	L3R2	L5R3
3	7	421-10	FLT	L5R3	L1R6	L2R4	L8R3
4	17	157-7	1/6th	L5R3	L3R1	L3R2	L4R3
5	18	157-5	1/6th	L6R3	L5R6	L2R2	L3R3
6	19	421-14	FLT	L5R3	L6R5	L2R3	L1R3
7	42	206-9	1/6th	L6R4	L7R6	L4R2	L6R3
8	43	206-5	1/6th	L8R1	L2R4	L4R2	L6R3
9	44	414-2	FLT	L8R1	L2R5	L5R4	L6R3
10	45	15-9	1/6th	L1R3	L6R5	L3R4	L6R3
11	46	15-5	1/6th	L6R2	L2R4	L8R4	L6R3
12	47	415-1	FLT	L8R3	L4R6	L5R1	L7R3
13	48	353-15	FSCP	L8R1	L5R6	L6R4	L2R3
14	49	353-5	FSCP	L8R1	L5R5	L5R3	L8R3
15	50	353-12	FSCP	L7R2	L2R5	L6R4	L8R3
16	51	523-2	FSE	L7R2	L3R4	L5R3	L8R3
17	52	525-4	FSE	L7R2	L4R6	L5R3	L8R3
18	53	416-1	FLT	L8R2	L6R2	L4R2	L1R3
19	54	355-8	FSCP	L7R3	L2R5	L6R4	L8R3
20	55	528-2	FSE	L6R6	L2R5	L7R1	L8R3
21	56	529-4	FSE	L7R4	L2R5	L6R3	L7R3
22	60	249-5	1/6th	L1R5	L8R6	L3R4	L8R3
23	61	249-9	1/6th	L3R5	L4R2	L3R4	L7R3
24	62	385-5	FSCP	L8R1	L2R5	L3R5	L1R3
25	63	385-2	FSCP	L8R1	L7R6	L5R3	L1R3
26	64	542-2	FSE	L8R1	L2R2	L2R4	L8R3
27	65	543-4	FSE	L8R1	L3R1	L2R4	L8R3
28	66	184-7	1/6th	L2R1	L4R6	L3R6	L8R3
29	67	184-5	1/6th	L1R2	L5R5	L3R6	L8R3
30	68	413-9	FSCP	L2R1	L5R5	L6R4	L8R3
31	69	413-12	FSCP	L3R4	L1R1	L6R4	L8R3
32	70	425-1	FLT	L8R3	L6R6	L3R2	L1R3
33	71	382-3	FSCP	L8R1	L4R3	L3R5	L8R3
34	72	545-2	FSE	L8R4	L2R2	L2R4	L8R3
35	73	546-4	FSE	L8R6	L6R2	L2R4	L8R3
36	76	384-2	FSCP	L8R1	L4R6	L3R5	L7R3
37	77	548-3	FSE	L6R2	L8R1	L2R4	L7R3
38	78	549-8	FSE	L7R6	L8R4	L2R4	L7R3
39	79	227-7	1/6th	L2R5	L5R2	L7R6	L5R3
40	80	227-5	1/6th	L2R2	L2R6	L6R6	L7R3
41	81	465-8	FSCP	L4R1	L4R3	L3R5	L8R3
42	82	465-5	FSCP	L2R3	L1R6	L5R3	L8R3

* FOR FLIGHT DATA, THESE ARE FLIGHT-RUN NUMBERS

DATA POINT I.D NO	MODEL SCALE	M_o	α (DEG)	β (DEG)	ρ (DEG)	$\Delta 3$ (DEG)	BYPASS*	% WAT2	RE NO. x 10^{-6}	ANALYSIS TIME (SEC)	PART–POINT**
1	FLT	0 4	16.4	–0.8	6 9	27.6	C	104 1	1 44	0 6	422-4
2	FLT	0 59	13 9	0 9	7.0	26.6	C	102.7	2 04	0 6	417-5
3	↓	0.52	10.0	0.7	↓	27.6	↓	107 1	1.33	0 6	417-4
4	↓	0.69	11 5	1 0	↓	26 5	↓	104 2	0 84	0 6	417-2
5	1/6th	0.60	–10 0	10 0	–3 0	10 6	C	97.2	0 43	0 144	164-1
6	1/6th	0 60	–10 0	10 0	–3 0	10 6	C	90 2	0.43	0 144	164-3
7	FLT	0 69	–8.4	10 6	0.6	10 5	C	101.2	1.40	0 88	421-10
8	1/6th	0 60	4 0	0	7 0	10 6	C	76.6	0 43	0.181	112-7
9	1/6th	0.60	4 0	0	7.0	10 6	C	108 6	0 43	0 181	112-5
10	FSE	0 60	4 0	0	5 2	10 0	C	97.7	3 41	1 110	116-2
11	FLT	0.67	4.3	0 7	6 9	11.1	C	94.4	3.58	0 72	424-2
12	↓	0 69	3.4	0.7	6 9	11 1	↓	74 1	3 68	0.76	425-6
13	↓	0.59	4.6	1.2	7 0	11.1	↓	107 9	1.74	0 62	412-2
14	↓	0 60	4 6	0 6	6.9	11.0	↓	76 2	1.66	1 11	424-11
15	FLT	0 85	8 8	–0 5	7 0	27 6	C	104 2	2 21	0 60	417-3
16	FLT	0.92	5 6	0.6	7 0	26 6	C	104 5	1.04	0 60	417-1
17	1/6th	0 90	–10.0	10 0	–3 0	10 6	C	70 2	0 34	0 113	157-7
18	1/6th	0 90	–10 0	10 0	–3 0	10 6	C	106.3	0 34	0 113	157-5
19	FLT	0.94	–8.9	10.2	1.0	10 5	C	107.1	1 6	0 69	421-14
20	FSE	0.90	–4.0	0	–1 0	8 2	C	97.8	3.64	1.990	102-2
21	FLT	0 90	–2.8	–0 2	–1 2	8 7	C	97 5	3.25	1 23	424-10
22	FLT	0 93	–3 3	0	–1 2	8 6	C	104 8	1 17	1 99	425-3
23	1/6th	0 90	4 0	0	7 0	10 6	C	76.8	0 34	0 369	67-9
24	1/6th	0 90	4 0	0	7 0	10 6	C	104 3	0 34	0 369	67-7
25	FSE	0 90	4 0	0	7 3	10 4	C	97 7	3 62	2 260	126-2
26	FLT	0.92	4 6	0 7	6 0	11 0	C	96 2	3.47	0.89	420-9
27	↓	0 91	5 2	0 5	6 9	11.1	↓	99.1	3 28	1 18	422-2
28	↓	0.92	4 2	0 1	7 0	11 0	↓	76 1	2.47	1.34	421-5
29	↓	0 90	4.1	0.5	6 9	11.1	↓	98.6	2 43	1 46	424-9
30	↓	0.90	5 1	0 1	7 0	11.0	↓	105.7	2 42	0 69	421-4
31	↓	0 90	3 5	0 2	7 0	11 0	↓	77.5	1.78	2 26	421 6
32	↓	0 90	5 2	–0 1	7 0	11 0	↓	100 1	1 79	0 70	421-7
33	↓	0 94	4 3	0 2	7.0	11.1	↓	105 6	1 89	1 06	421 8

*C = Closed

GP76 0323-6

**For flight test, these data are flight run numbers

TABLE D-1
DATA MATRIX

DATA POINT I.D. NO.	MODEL SCALE	M_∞	α (DEG)	β (DEG)	ρ (DEG)	$\Delta 3$ (DEG)	BYPASS*	% WAT2	RE NO. x 10^{-6}	ANALYSIS TIME (SEC)	PART–POINT**
34	FLT	1.21	1.5	0	6 0	27.6	C	98 3	2.97	0 60	423-4
35	FLT	1.24	3.0	0.8	6.7	27 6	C	96.4	1 52	0 60	423-3
36	1/6th	1 2	10.0	0	7.0	10 6	C	76 6	0.45	0 198	131-7
37	1/6th	1.2	10 0	0	7.0	10 6	C	107.9	0.45	0.198	131-5
38	FLT	1 18	7.7	0 3	7 0	11.0	C	74 0	3.22	1.21	424-12
39	↓	1.2	7.4	−0.1	7 1	11.1	↓	94.4	3.35	1.19	424-13
40	↓	1.17	10 6	0 0	7 0	11.0	↓	103 4	1 40	0 60	421-17
41	FLT	1.54	1 5	0	−1 4	27 0	Auto	95 4	2.17	0 60	424-6
42	1/6th	1 6	−4 0	0	−2 0	13.5	C	87.3	0.21	0.106	206-9
43	1/6th	1 6	−4 0	0	−2.0	13 5	C	96.9	0 21	0 106	206-5
44	FLT	1 57	−3.6	0 7	−2.3	13.7	C	89.3	1 46	0 65	414-2
45	1/6th	1.8	−2.0	0	−3 0	17.4	C	80 5	0 22	0.210	15-9
46	1/6th	1 8	−2.0	0	−3 0	17.4	C	91 0	0 22	0 201	15-5
47	FLT	1 75	−2 6	0 4	−2 2	16.7	C	80 7	1.41	1.23	415-1
48	FSCP	1 8	−2.0	0	−3 0	18 7	C	75 1	1.45	0.680	353-15
49	↓	↓	−2.0	↓	−3 0	↓	↓	82.2	1.45	0.680	353-5
50	↓	↓	−2.0	↓	−3.0	↓	↓	85 4	1 44	0 680	353-12
51	FSE	1.8	−2.0	0	−2.9	18 6	C	80 6	1.46	0 680	523-2
52	FSE	1 8	−2 0	0	−2.9	18.6	C	79 8	1 46	0 680	525-4
53	FLT	1 81	−2 3	0 2	−2 9	18 2	C	78 9	1.53	0 680	416-1
54	FSCP	1 8	4 0	0	2.5	18.7	C	79.9	1.45	2.800	355-8
55	FSE	1 8	4 0	0	2.5	18 7	C	80 8	1.46	2 800	528-2
56	FSE	1 8	4 0	0	2 5	18.7	C	79.7	1 46	2.800	529-4
57	FLT	2.0	2.5	0 2	2 3	20 9	Auto	77.0	1 72	2 800	425-2

GP78-0323-9

*C = Closed

**For flight test, these data are flight-run numbers

TABLE D-1 (Continued)
DATA MATRIX

DATA POINT I D. NO	MODEL SCALE	M_0	α (DEG)	β (DEG)	ρ (DEG)	$\Delta 3$ (DEG)	BYPASS*	% WAT2	RE NO. x 10^{-6}	ANALYSIS TIME (SEC)	PART–POINT**
58	1/6th	2 2	−2 0	0	−4 0	22 5	C	68 6	0 22	0 100	250 7
59	FSCP	2 2	−2 0	0	−4 0	22 5	C	69 2	1.48	0 600	411-6
60	1/6th	2 2	−2 0	0	−4 0	25 0	O	65 0	0 22	0 100	249-5
61	1/6th	2 2	−2 0	0	−4 0	25 0	O	52 9	0 22	0 100	249-9
62	FSCP	2 2	−2 0	0	−4 0	25 0	O	61 7	1 48	0 600	385-5
63	FSCP	2 2	−2 0	0	−4.0	25 0	O	62 3	1.48	0 600	385-2
64	FSE	2 2	−2 0	0	−4 0	24 8	P	60 2	1 27	0 600	542-2
65	FSE	2 2	−2 0	0	−4 0	24.8	P	60 5	1.27	0 600	543 4
66	1/6th	2 2	0	0	−2 0	22 5	C	69 3	0 22	0 106	184-7
67	1/6th	2 2	0	0	−2 0	22 5	C	75 4	0 22	0 106	184-5
68	FSCP	2 2	0	0	−2.0	22 5	C	73 6	1 47	0 650	413-9
69	FSCP	2 2	0	0	−2 0	22 5	C	68.3	1 47	0 650	413-12
70	FLT	2 2	0 1	0 2	−2.2	22 9	C	73 0	2 34	0 650	425-1
71	FSCP	2 2	4 0	0	0 0	25 0	O	60 7	1 48	0 600	382-3
72	FSE	2 2	4.0	0	1 0	25 0	O	59.2	1 28	0.600	545-2
73	FSE	2 2	4.0	0	1 0	25 0	O	58 2	1 27	0 600	546 4
74	1/6th	2 2	12 0	0	6 0	25 0	O	47 3	0 22	0 100	252-9
75	1/6th	2 2	12 0	0	6 0	25 0	O	65 0	0 22	0 100	252-5
76	FSCP	2.2	12 0	0	6 8	25 0	O	60 8	1.48	0 600	384-2
77	FSE	2.2	11 0	0	6 8	24 8	O	59 0	1.28	0 600	548-3
78	FSE	2 2	11 0	0	6 8	24 8	P	59 8	1 27	0 600	549 8
79	1/6th	2 5	0	0	−4 0	26 0	O	63 1	0 21	0 100	227-7
80	1/6th	2 5	0	0	−4 0	26 0	O	68 2	0 21	0.100	227-5
81	FSCP	2.5	0	0	−4 0	26 0	O	62 8	1 28	0 600	465 8
82	FSCP	2 5	0	0	−4 0	26 0	O	68 9	1.28	0 600	465 5

*O = Open, C = Closed, P = Partial

GP78 0323 10

**For flight test, these data are flight run numbers

TABLE D-1 (Concluded)
DATA MATRIX

SERIES VII - NASA DATA STUDY

DATA PART/POINT 164/1 IDENT 5 FREQUENCY RANGE = 6 — 12000 Hz
THE SEGMENT START TIME WAS AT 22 11 52 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 6	—10	10	—3 0	10 6	0 0	97 2%	—11 7

1 PSIA = 6 8948 kPa

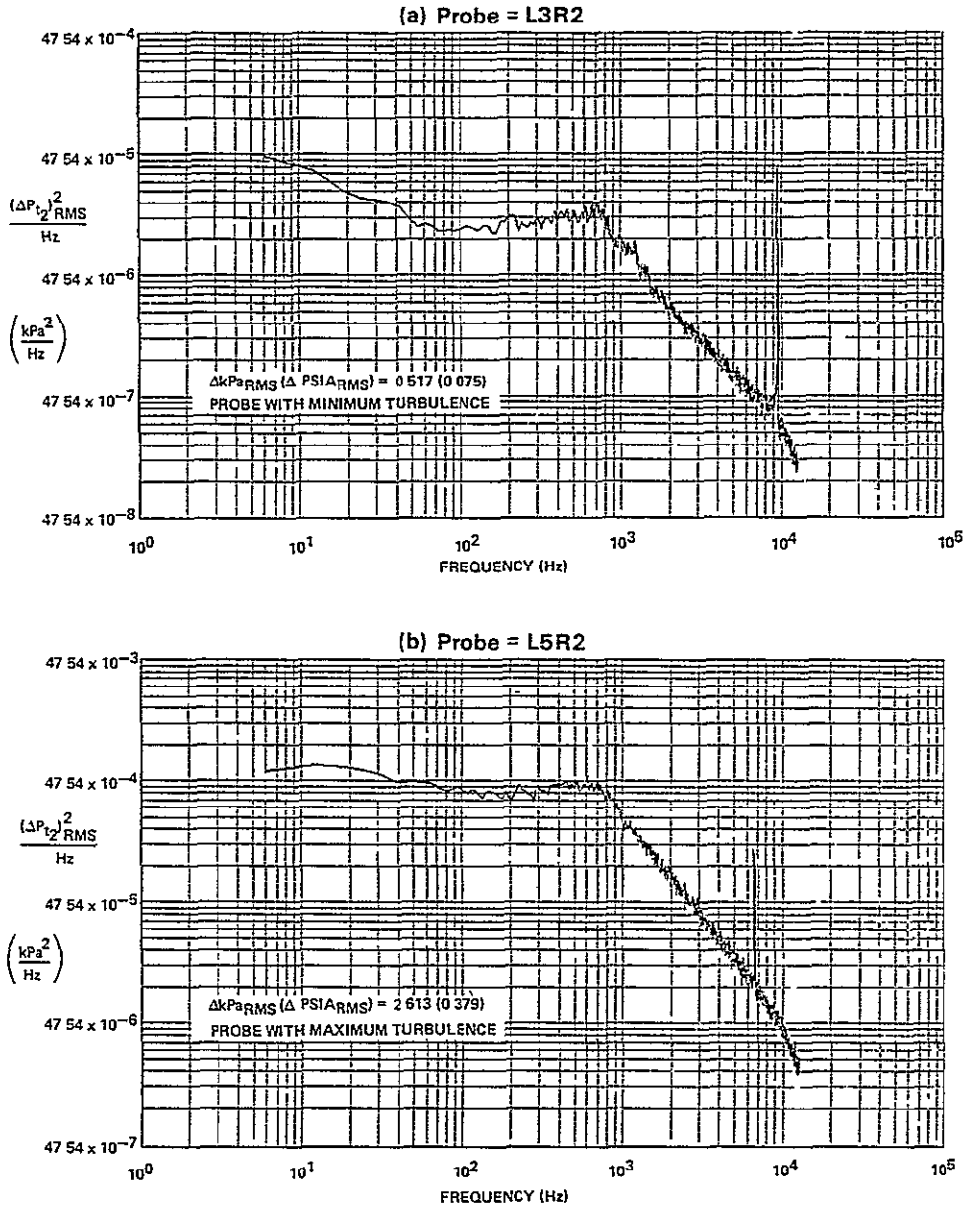


FIGURE D-1
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 0.6, α = —10, β = 10, WAT2 = 97.2%

SERIES VII - NASA DATA STUDY

DATA PART/POINT 164/1 IDENT 5 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 22 11.52 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 6	—10	10	—3 0	10 6	0 0	97 2%	—11 7

1 PSIA = 6 8948 kPa

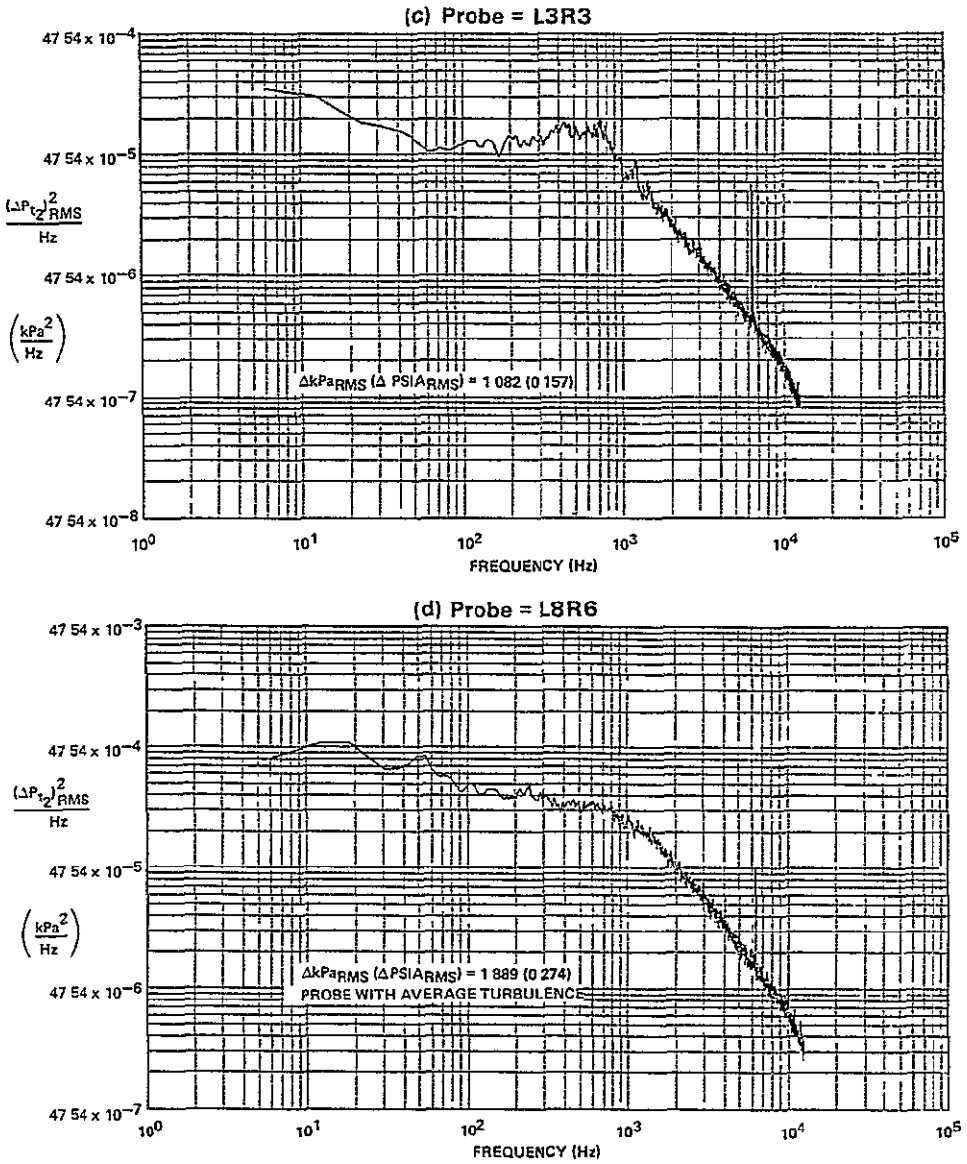


FIGURE D-1 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 0.6$, $\alpha = -10$, $\beta = 10$, WAT2 = 97.2%

SERIES VII - NASA DATA STUDY

DATA PART/POINT 164/3 IDENT 6 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 22 13 53 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 6	—10	10	—3 0	10 6	0 0	90 2%	—18 6

1 PSIA = 6 8948 kPa

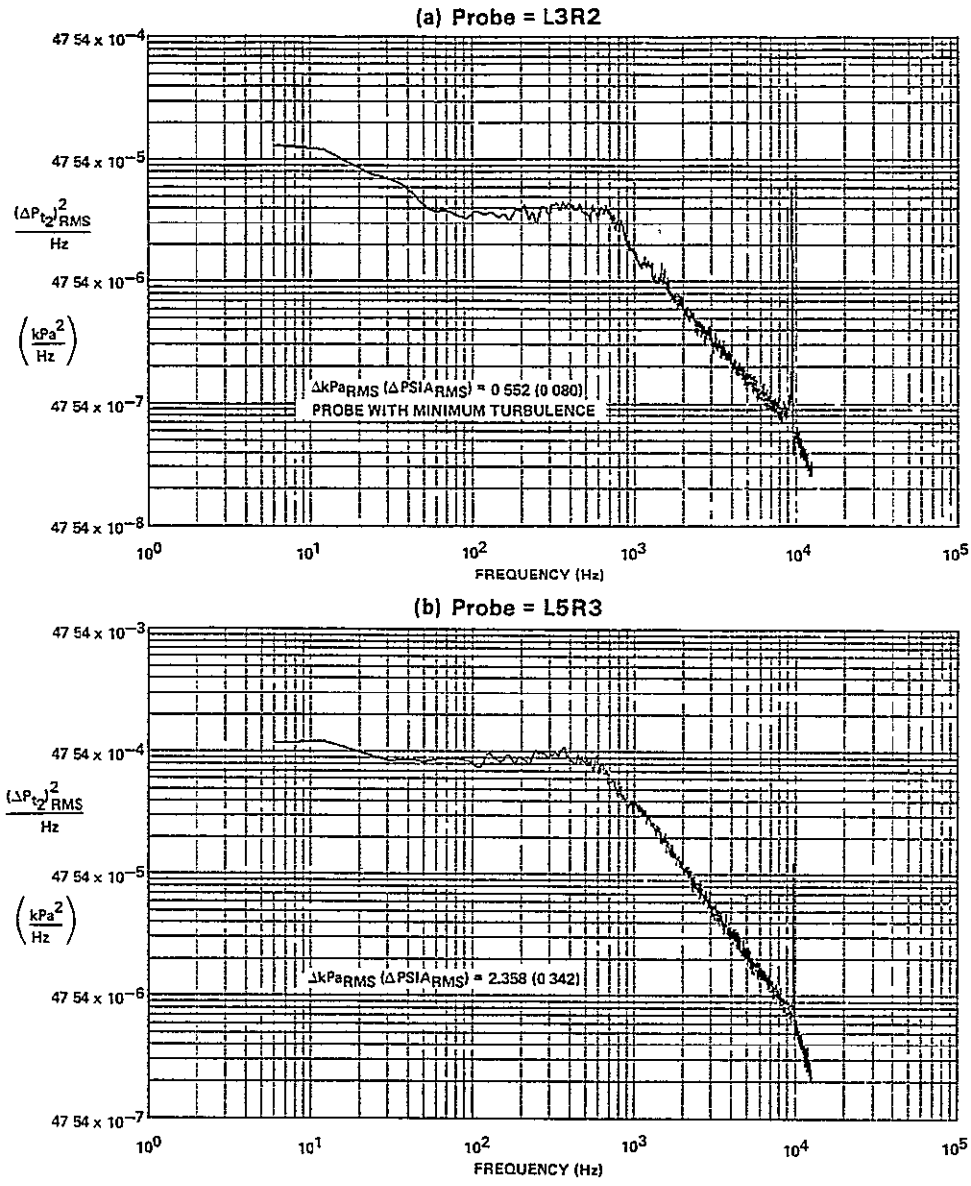


FIGURE D-2
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 0.6$, $\alpha = -10$, $\beta = 10$, WAT2 = 90.2%

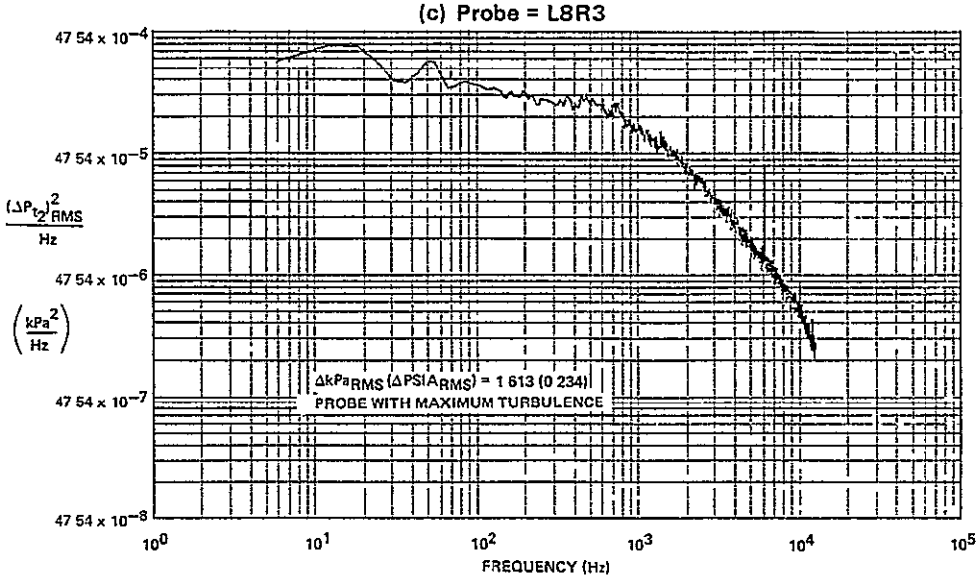
SERIES VII - NASA DATA STUDY

DATA PART/POINT 164/3 IDENT 6 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 22 13 53 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 6	—10	10	—3 0	10 6	0 0	90 2%	—18 6

1 PSIA = 6 8948 kPa

(c) Probe = L8R3



(d) Probe = L7R6

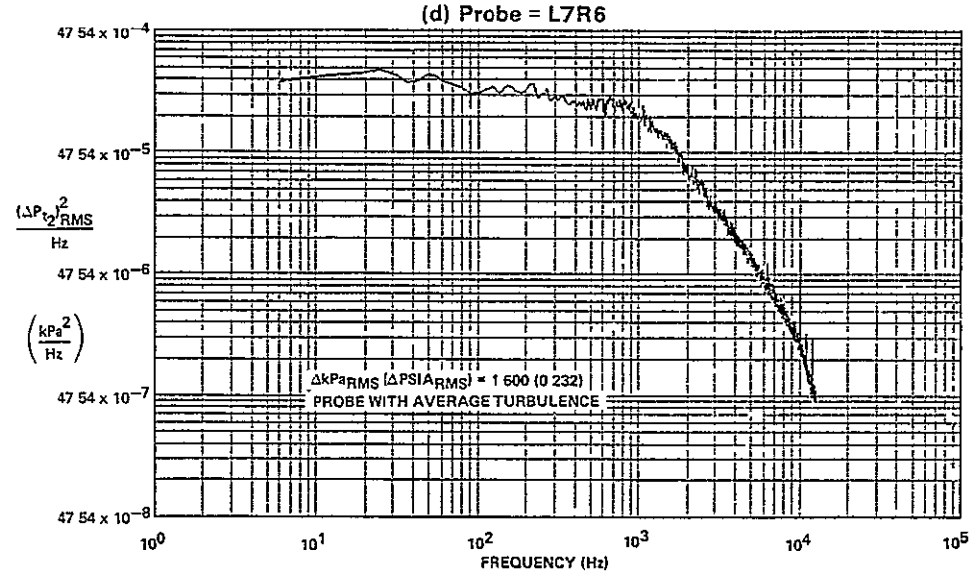


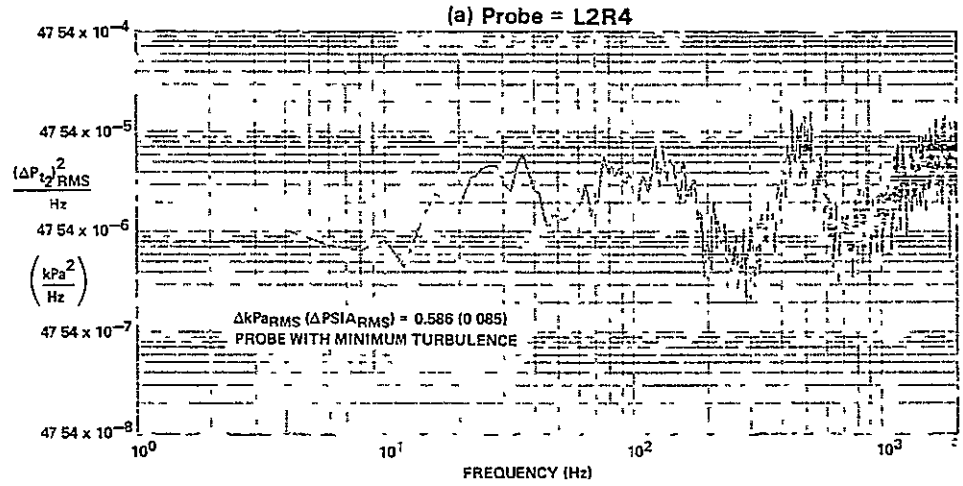
FIGURE D-2 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 0.6, α = —10, β = 10, WAT2 = 90.2%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 421/10 IDENT 7 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 21 09 24 580
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
0 69	—8 5	10 5	12143 (39840)	0 6	10 5	0 0	101 2%	—8 513

1 PSIA = 6 8948 kPa



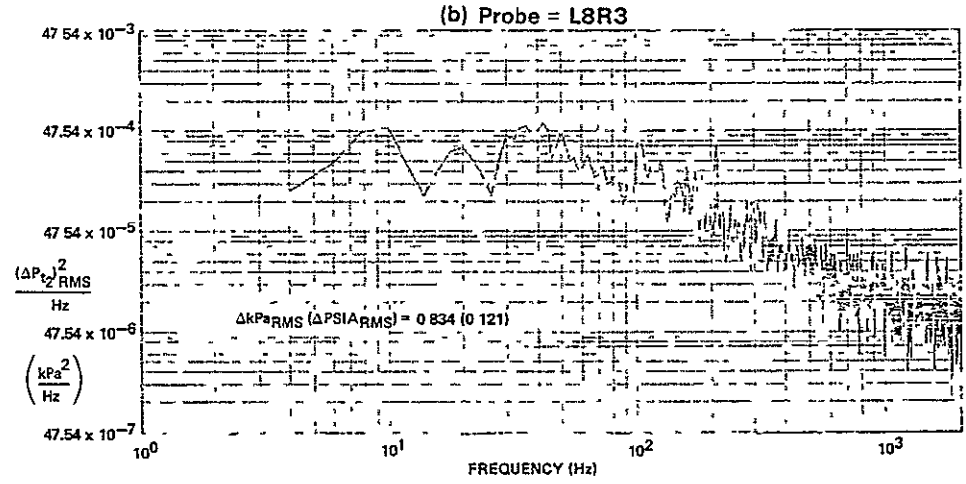


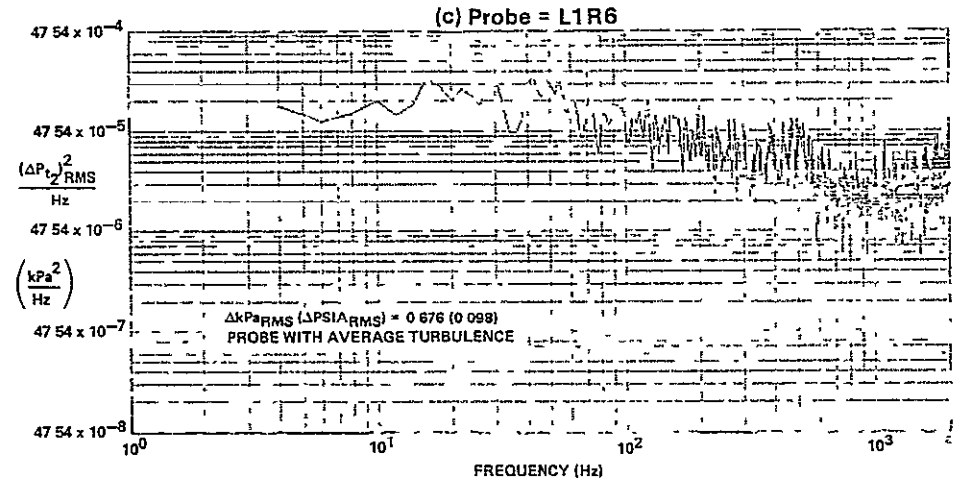
FIGURE D-3
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 0.69, α = —8.5, β =10.5, WAT2 = 101.2%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 421/10 IDENT 7 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 21 09 24 580
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
0 69	—8 5	10 5	12143 (39840)	0 6	10 5	0 0	101 2%	—8 513

1 PSIA = 6 8948 kPa



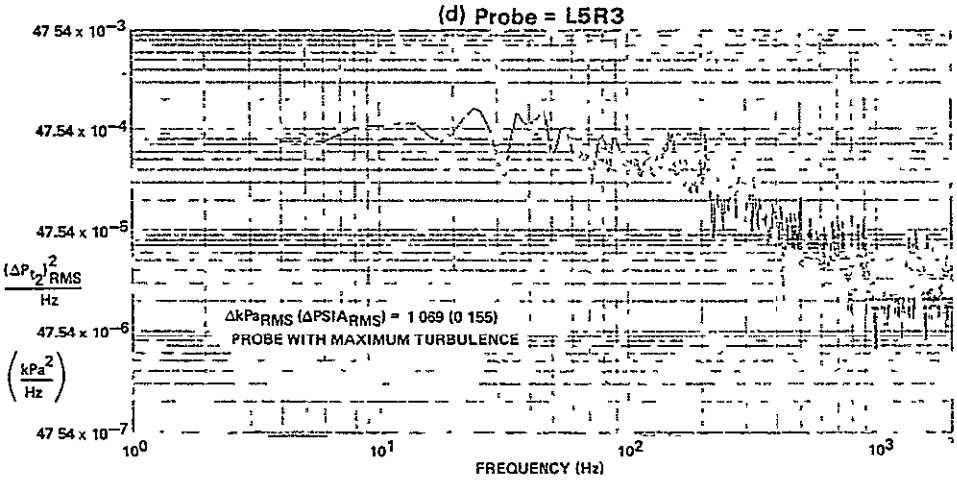


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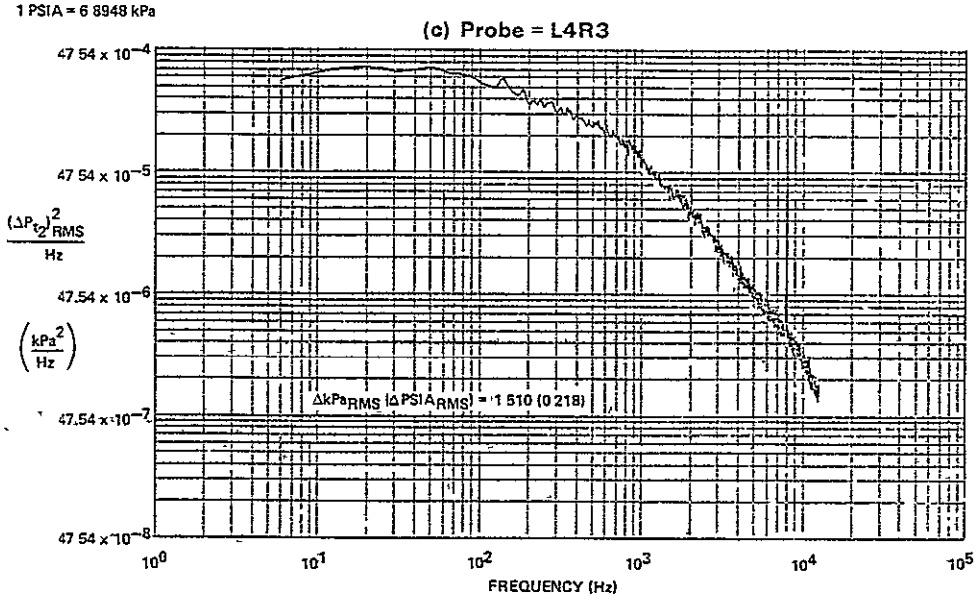
FIGURE D-3 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 0.69, α = —8.5, β=10.5, WAT2 = 101.2%

DATA PART/POINT 157/7 IDENT 17 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 10 56 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 9	−10	10	−3 0	10 6	0 0	70 2%	−25 0

1 PSIA = 6 8948 kPa



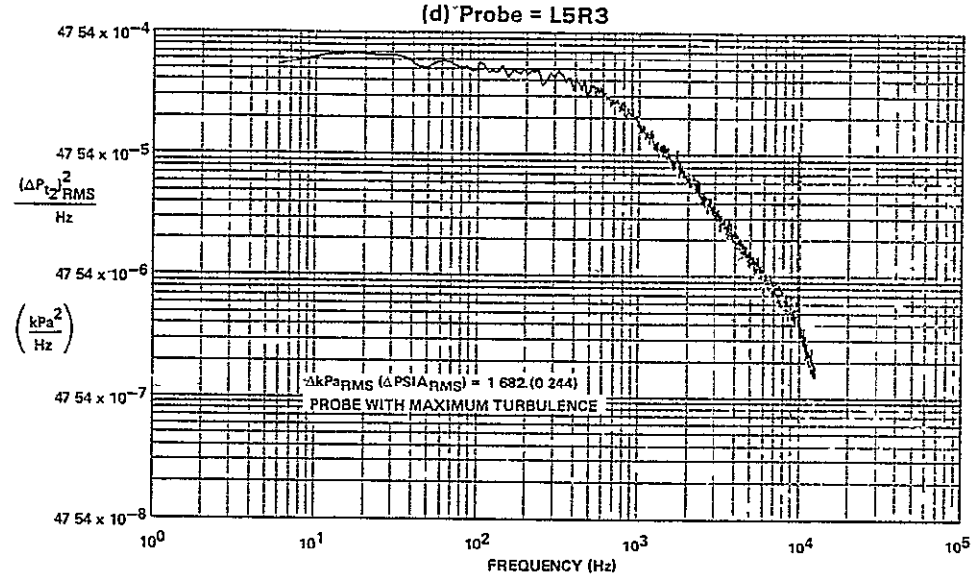


FIGURE D-4 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 0.9$, $\alpha = -10$, $\beta = 10$, WAT2 = 70.2%

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SERIES VII - NASA DATA STUDY

DATA PART/POINT 157/5 IDENT 18 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 08 47 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 9	—10	10	—3 0	10 6	0 0	106 3%	—5 0

1 PSIA = 6 8948 kPa

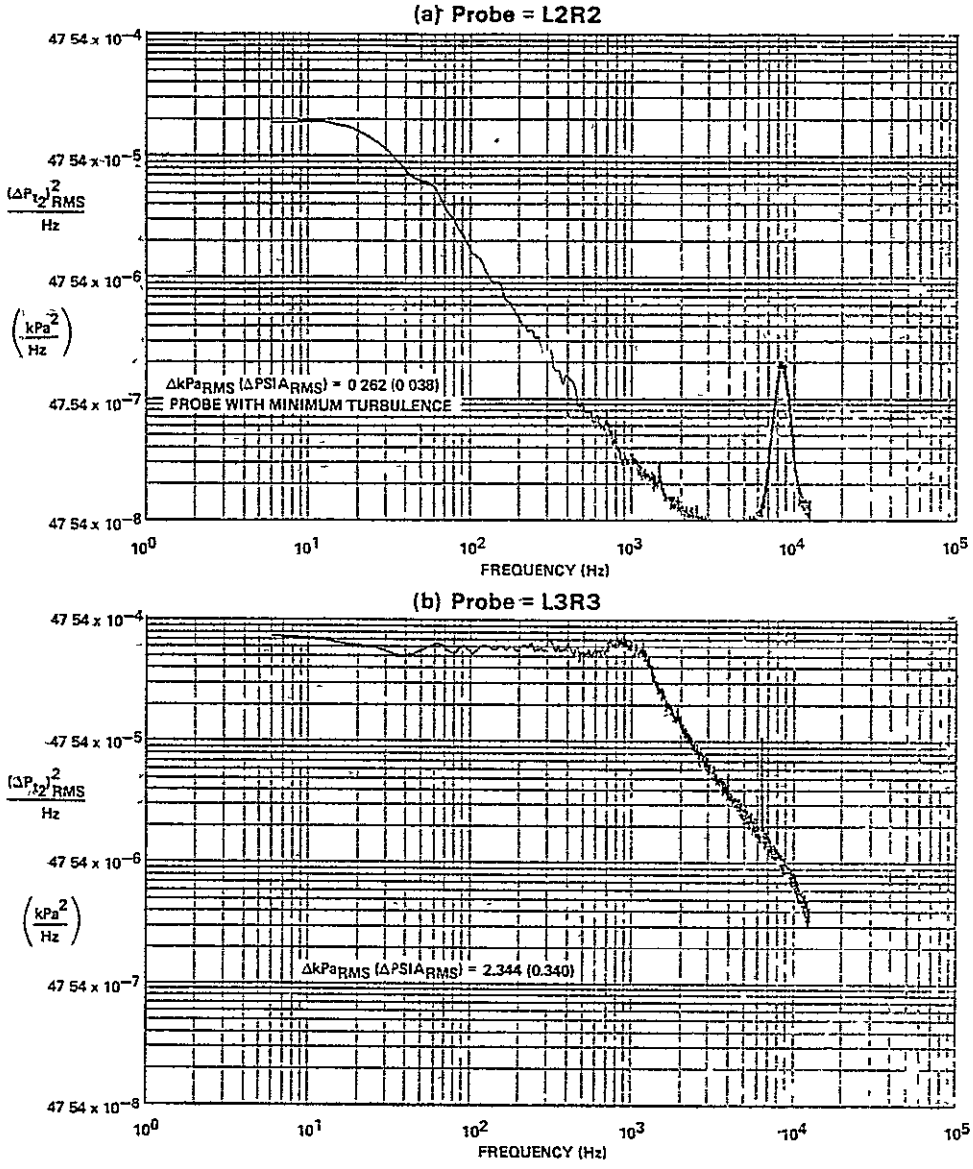

FIGURE D-5
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 0.9, α = —10, β = 10, WAT2 = 106.3%

SERIES VII - NASA DATA STUDY

DATA PART/POINT 157/5 IDENT 18 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 08 47 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
0 9	—10	10	—3 0	10 6	0 0	106 3%	—5 0

1 PSIA = 6 8948 kPa

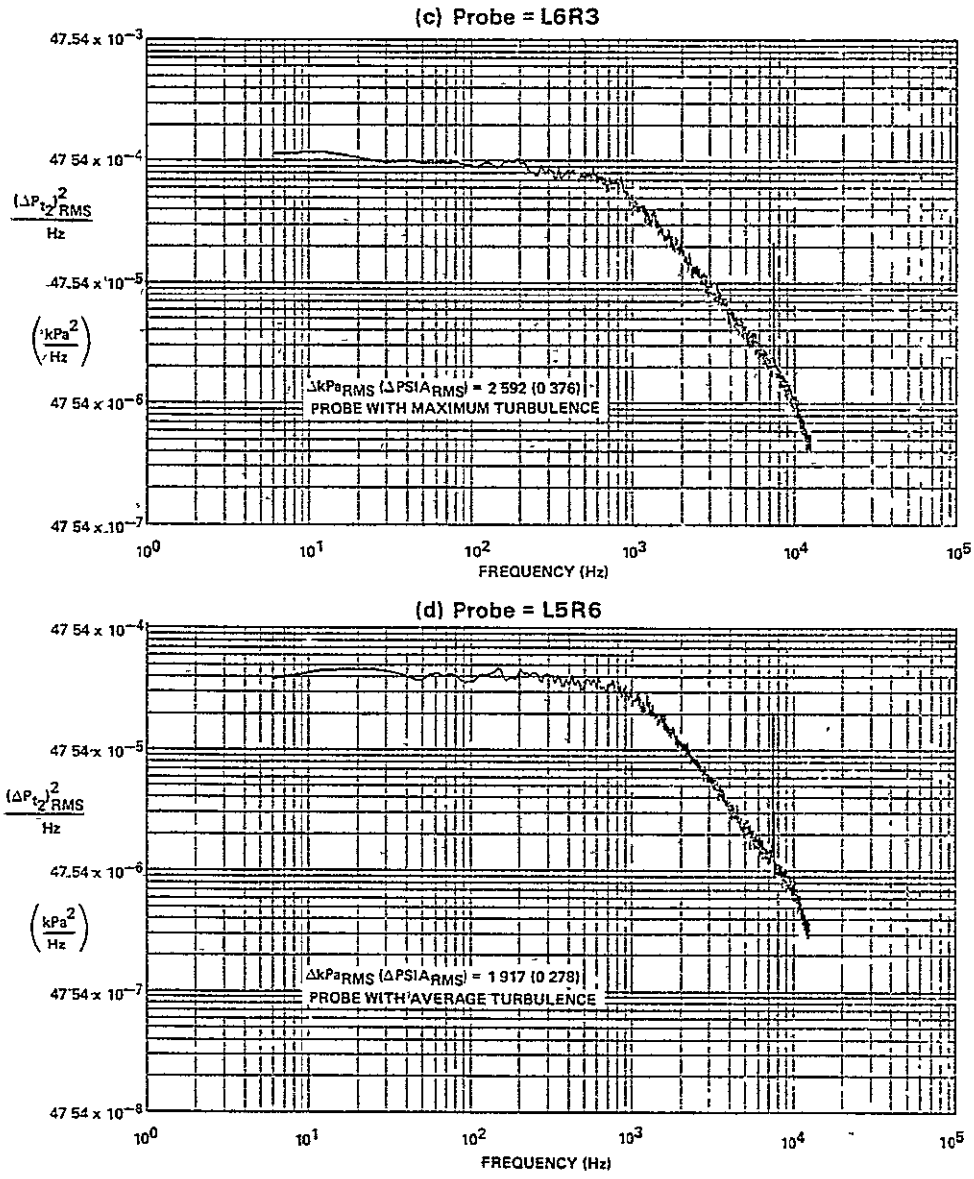

FIGURE D-5 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 0.9$, $\alpha = -10$, $\beta = 10$, WAT2 = 1

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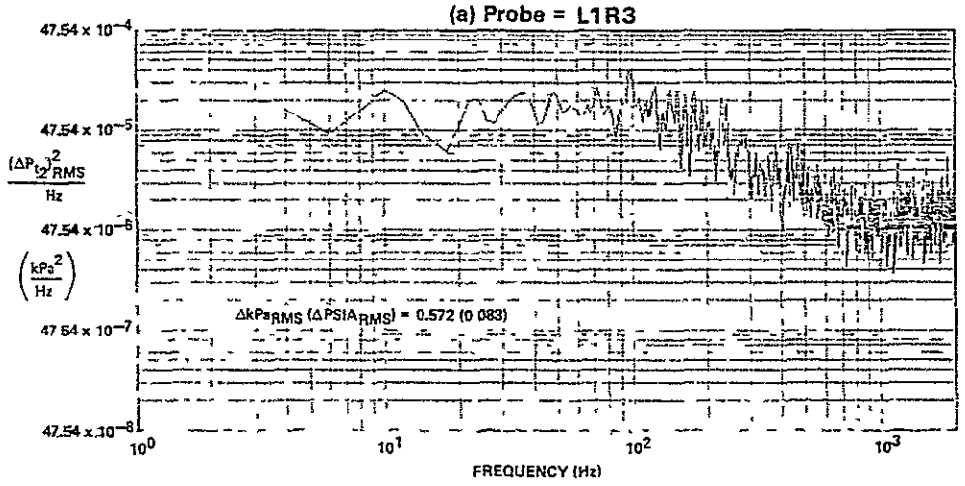
FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 421/14 IDENT 19 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 21 16 07 140
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
0 94	—8 9	10 2	13402 (43970)	1 0	10 5	0 0	107 1%	—5 000

1 PSIA = 6 8948 kPa



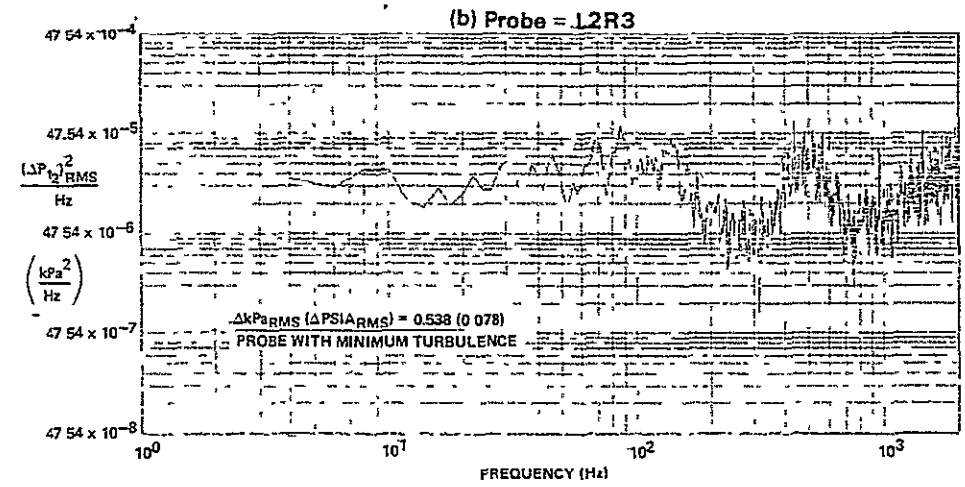


FIGURE D-6
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 0.94, α = —8.9, β = 10.2, WAT2 = 107.1%

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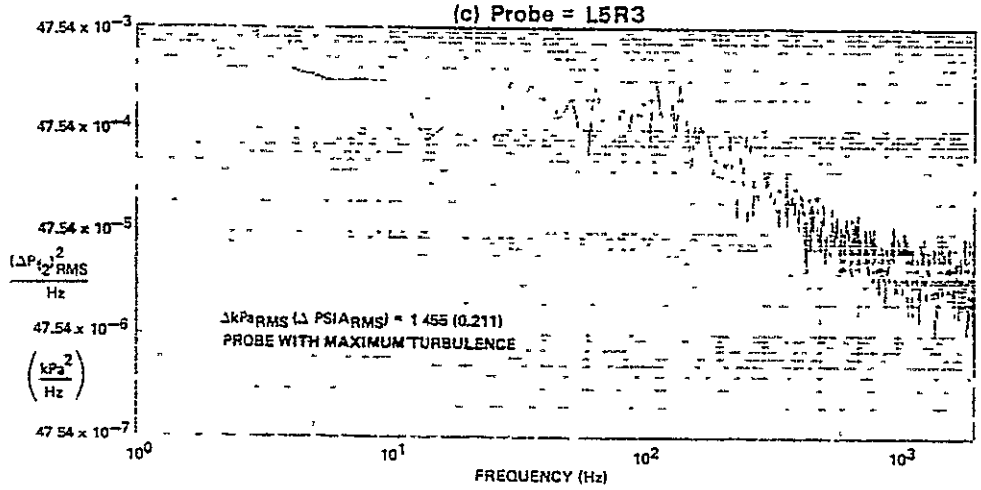
FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 421/14 IDENT 19 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 21 16 07 140
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
0 94	—8 9	10 2	13402 (43970)	1 0	10 5	0 0	107 1%	—5 000

1 PSIA = 6 8948 kPa



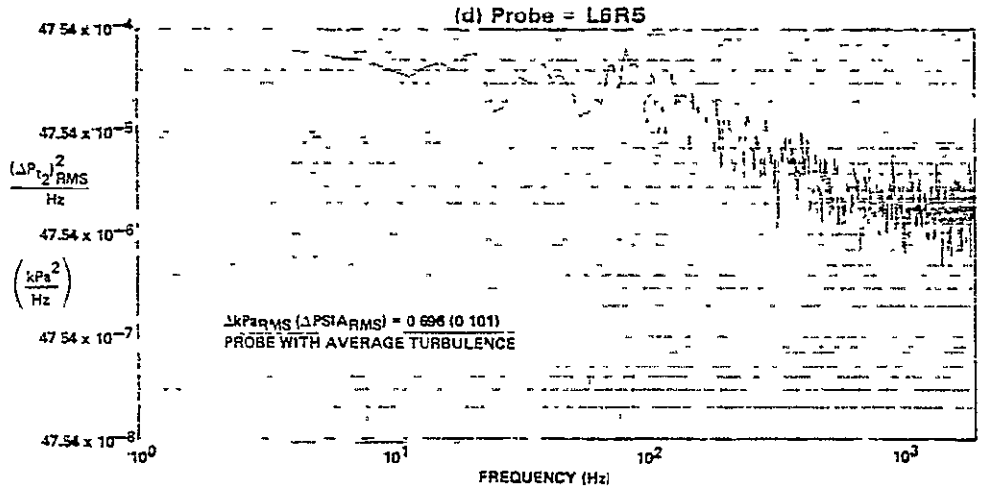


FIGURE D-6 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 0.94$, $\alpha = -8.9$, $\beta = 10.2$, WAT2 = 107.1%

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SERIES VIII - NASA DATA STUDY

DATA PART/POINT 206/9 IDENT 42 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 03 42 05 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 6	—4	0	—2 0	13 5	0 0	87 3%	—21 8

1 PSIA = 6 8948 kPa

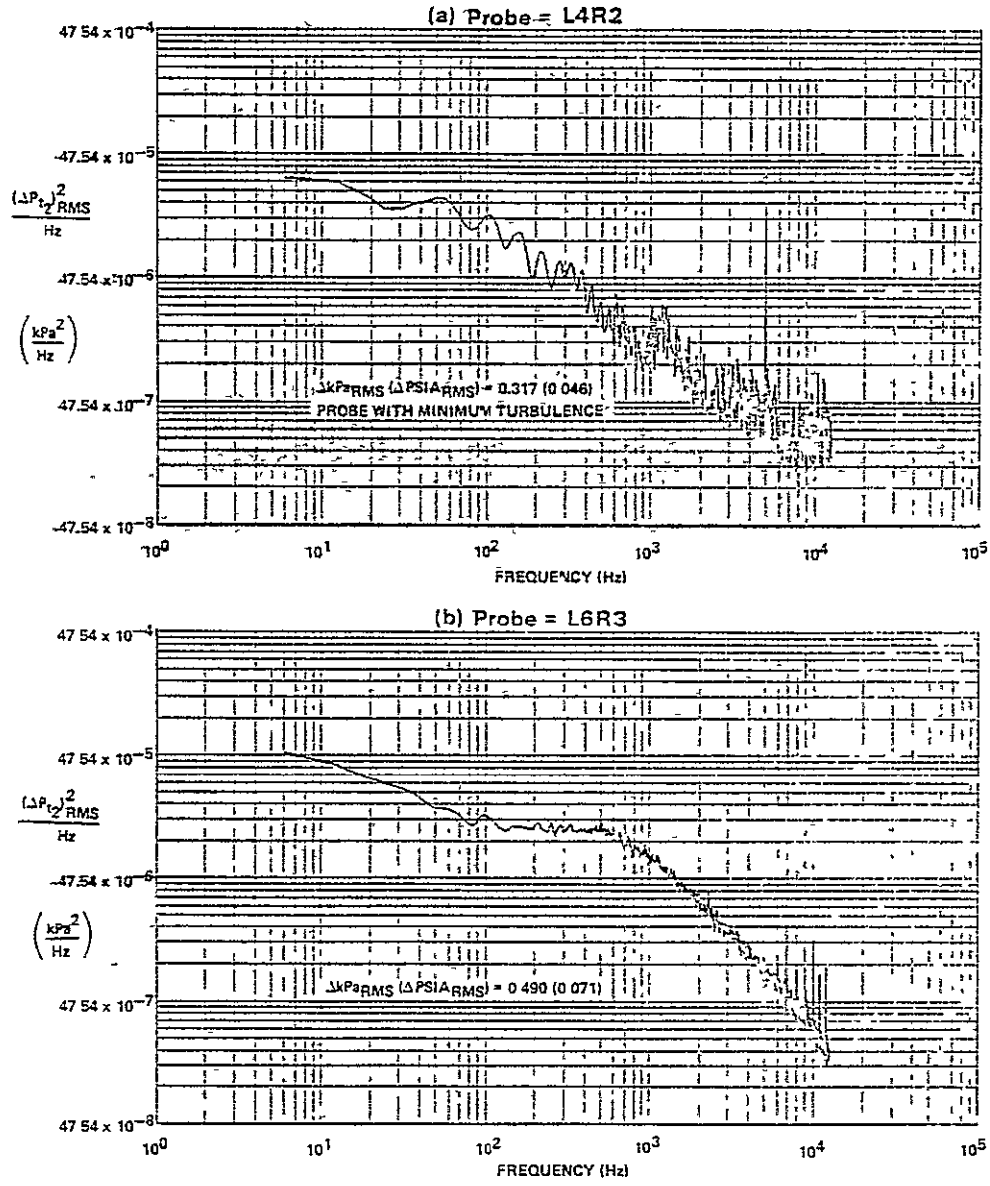

FIGURE D-7
POWER SPECTRAL DENSITY PLOTS FOR
$M_D = 1.6$, $\alpha = -4$, $\beta = 0$, WAT2 = 87.3%

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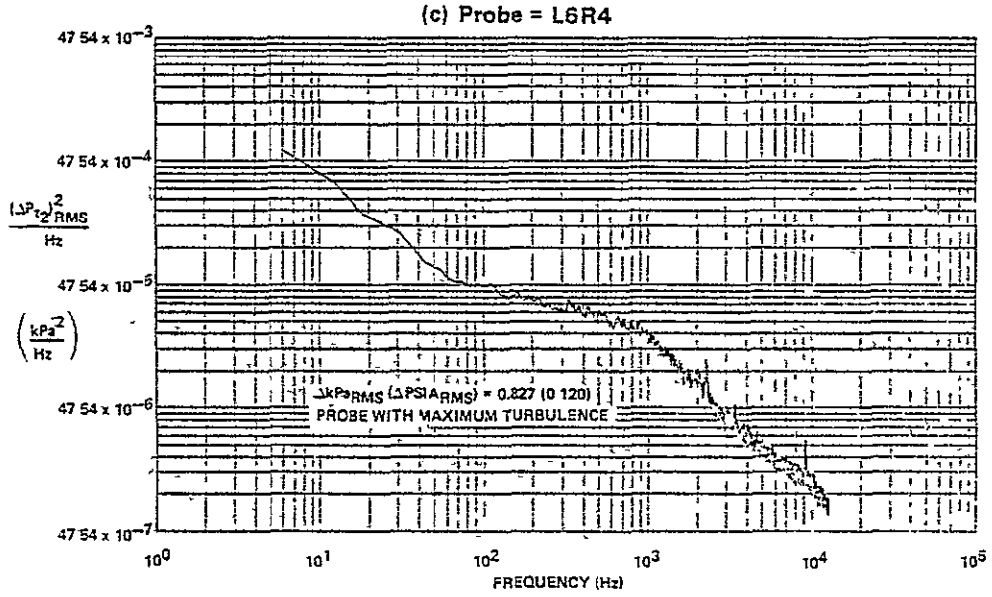
SERIES VIII - NASA DATA STUDY

DATA PART/POINT 206/9 IDENT 42 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 03 42 05 000
BANDWIDTH = 12.2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 6	—4	0	—2.0	13 5	0 0	87 3%	—21 8

1 PSIA = 6 8948 kPa

(c) Probe = L6R4



(d) Probe = L7R6

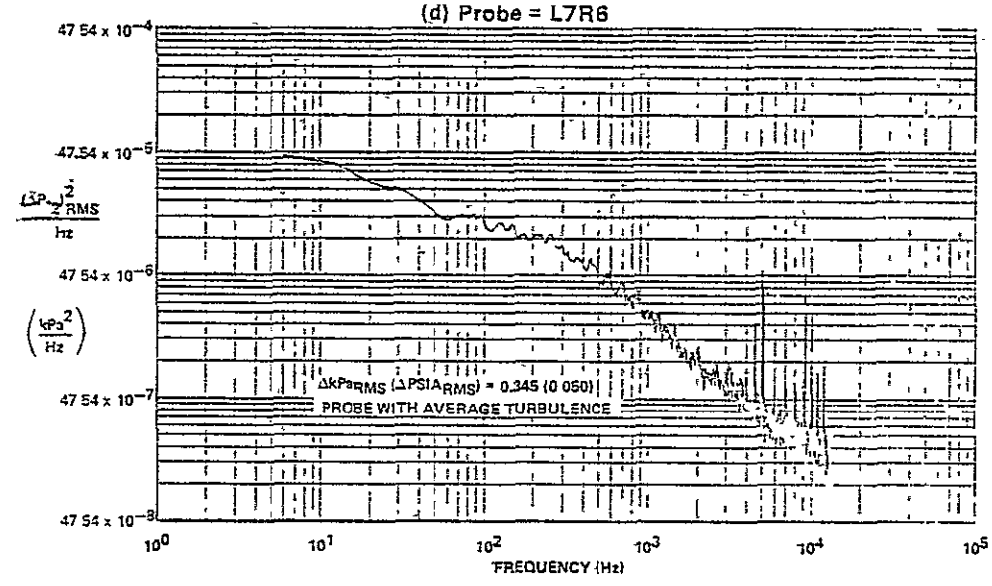


FIGURE D-7 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.6$, $\alpha = -4$, $\beta = 0$, WAT2 = 87.3%

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SERIES VIII - NASA DATA STUDY

DATA PART/POINT 206/5 IDENT 43 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 03 30 06 000
BANDWIDTH = 12.2 Hz RECORD LENGTH = 10.0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 6	−4	0	−2 0	13 5	0 0	96 9%	−12 0

1 PSIA = 6.8948 kPa

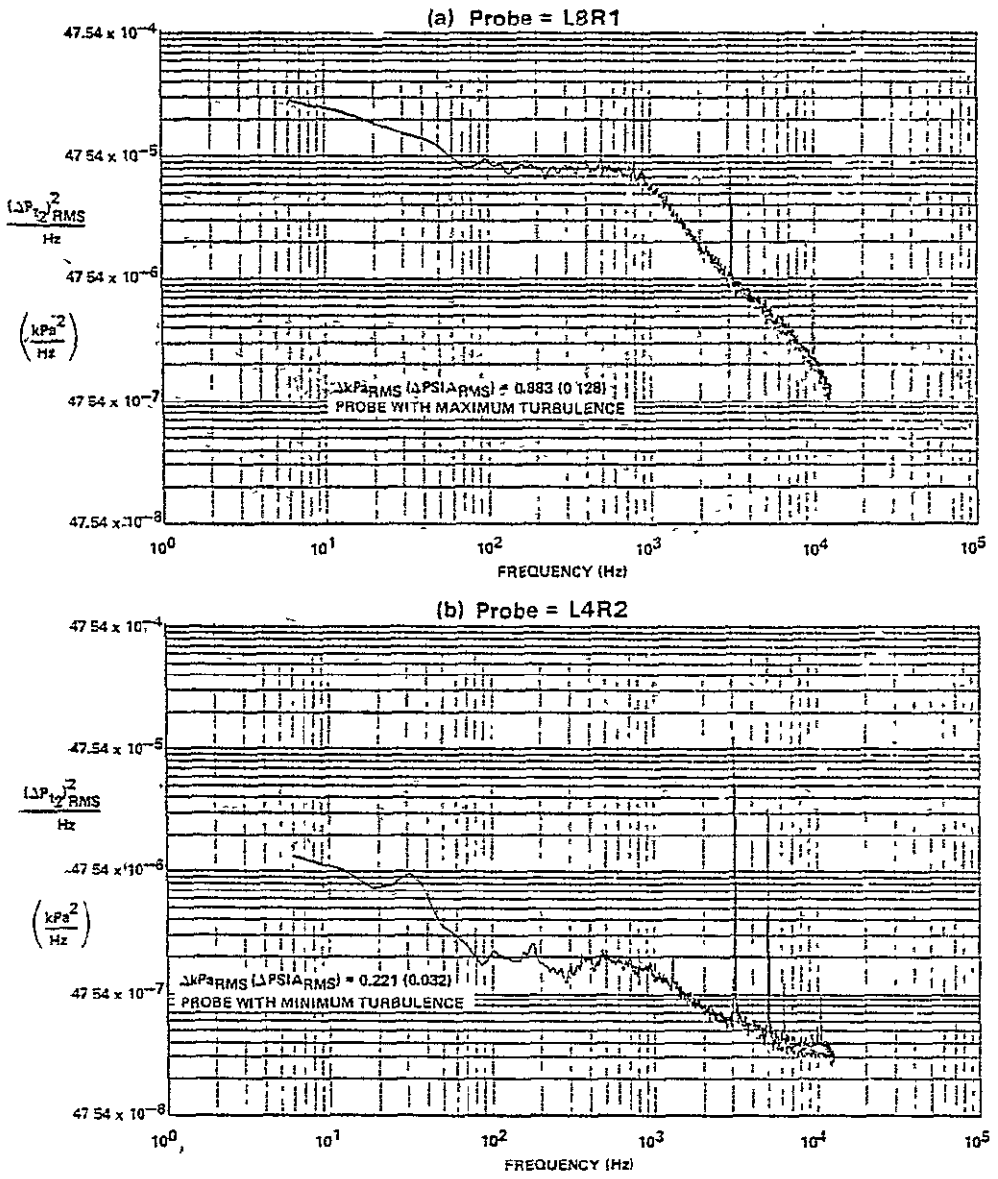

FIGURE D-8
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 1.6$, $\alpha = -4$, $\beta = 0$, WAT2 = 96.9%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 206/5 IDENT 43 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 03 30 06 000
BANDWIDTH = 12.2 Hz RECORD LENGTH = 10.0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1.6	—4	0	—2.0	13.5	0.0	96.9%	—12.0

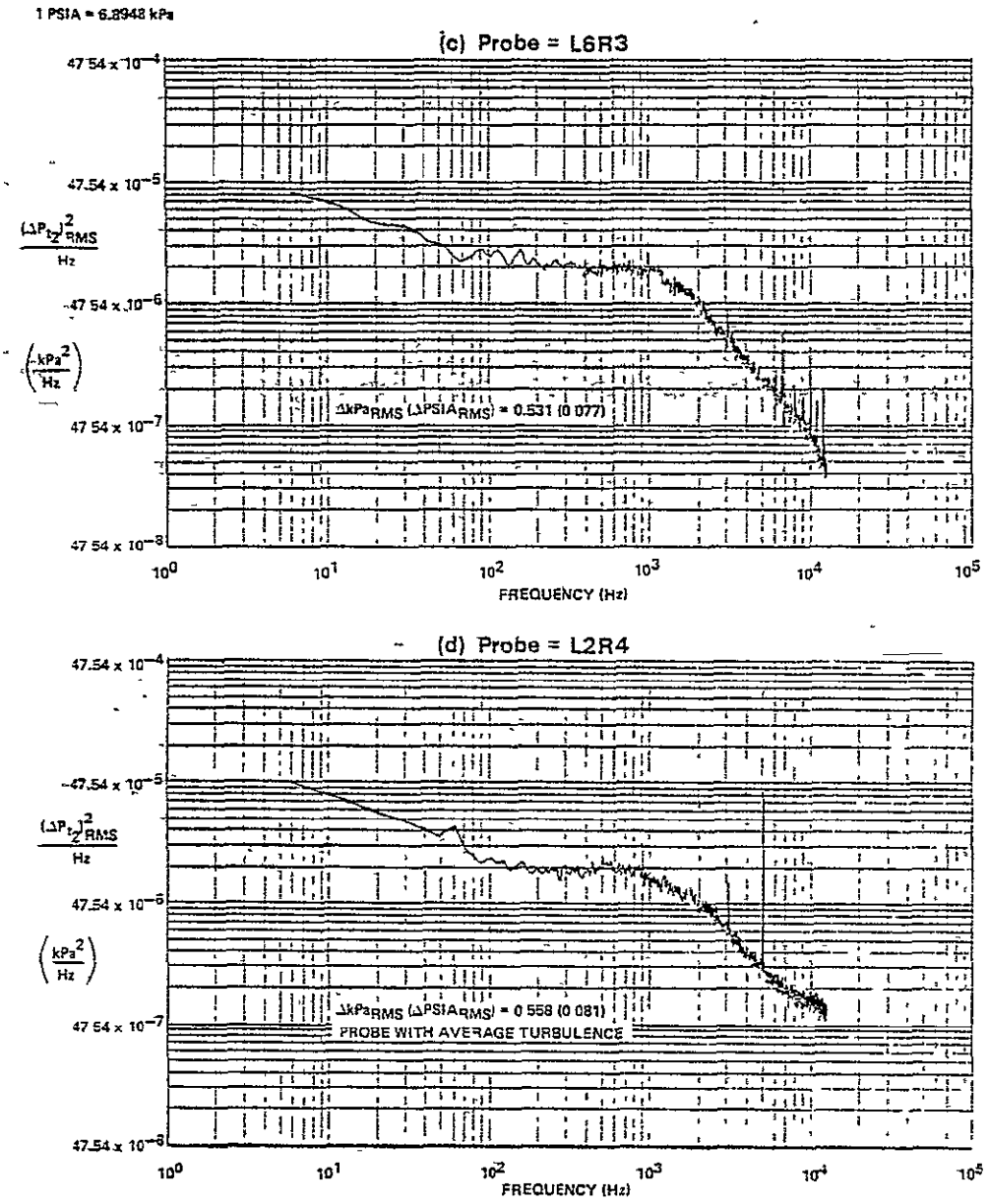

FIGURE D-8 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.6$, $\alpha = -4$, $\beta = 0$, WAT2 = 96.9%

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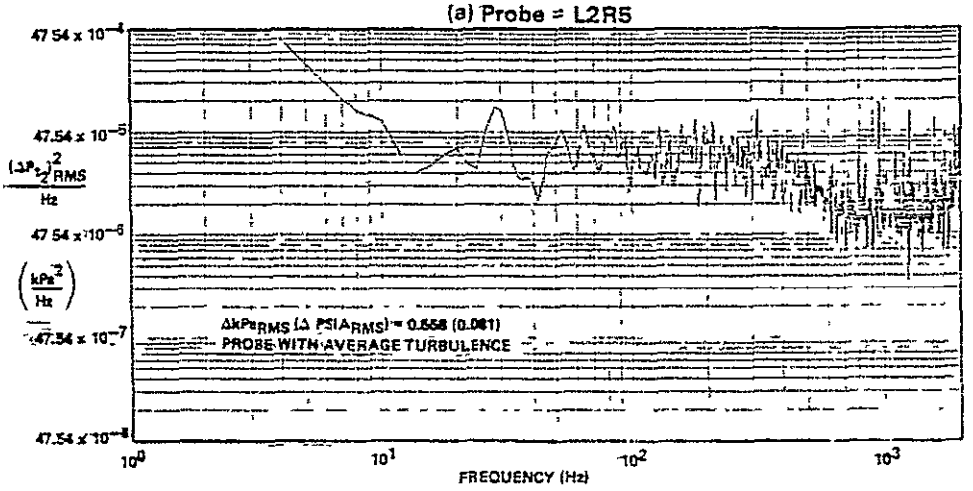
FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 414/2 IDENT 44 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 20 16 48 820
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
1.57	—3 8	0 6	17157.(56290)	—2 3	13 7	0 0	89 3%	—20 60

1 PSIA = 6.8948 kPa



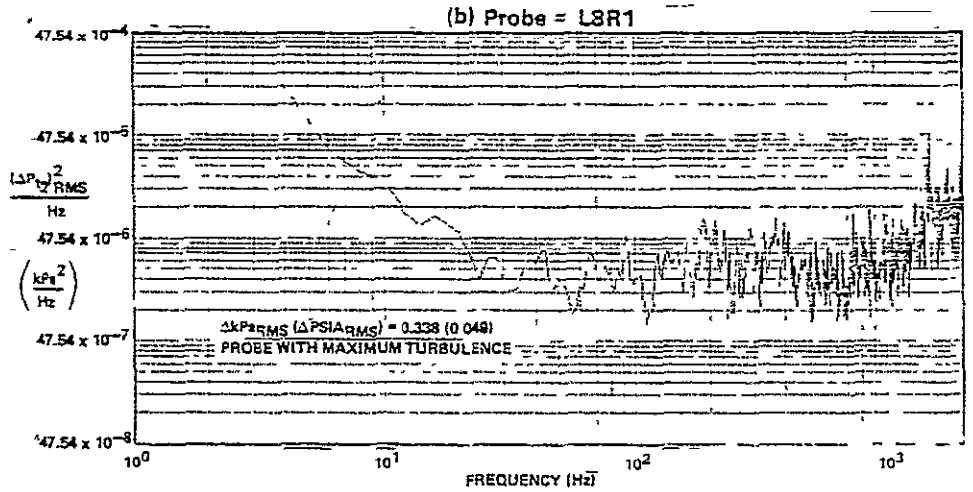


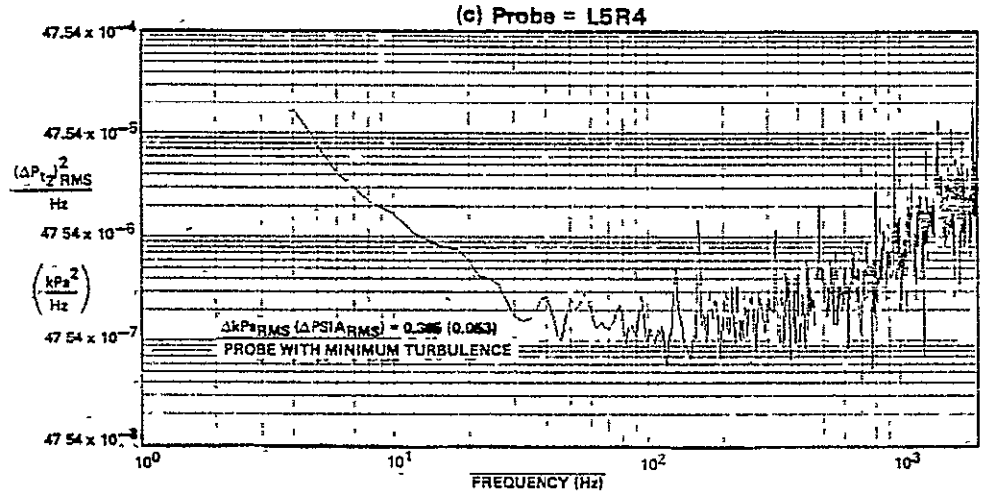
FIGURE D-9
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 1.57$, $\alpha = -3.6$, $\beta = 0.6$, WAT2 = 89.3%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 414/2 IDENT 44 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 20 16 46 820
BANDWIDTH = 4.0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
1 57	—3.6	0 6	17157 (56290)	—2 3	13 7	0 0	89 3%	—20 60

1 PSIA = 6.8948 kPa



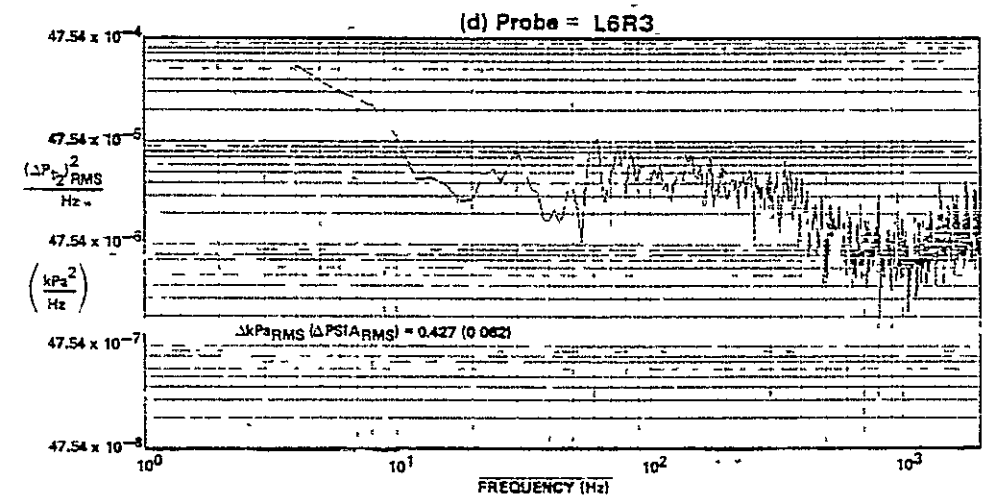
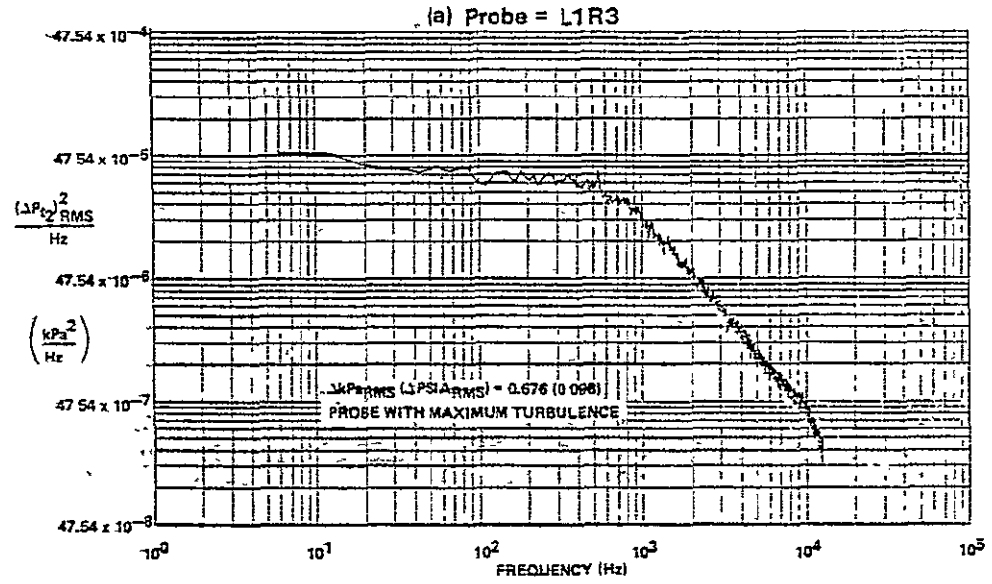


FIGURE D-9 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.57, α = —3.6, β = 0.6, WAT2 = 89.3%

DATA PART/POINT 15/9 IDENT 46 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 02 03 15 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3 0	17 4	0 0	80 5%	—25 0

1 PSIA = 6.8948 kPa



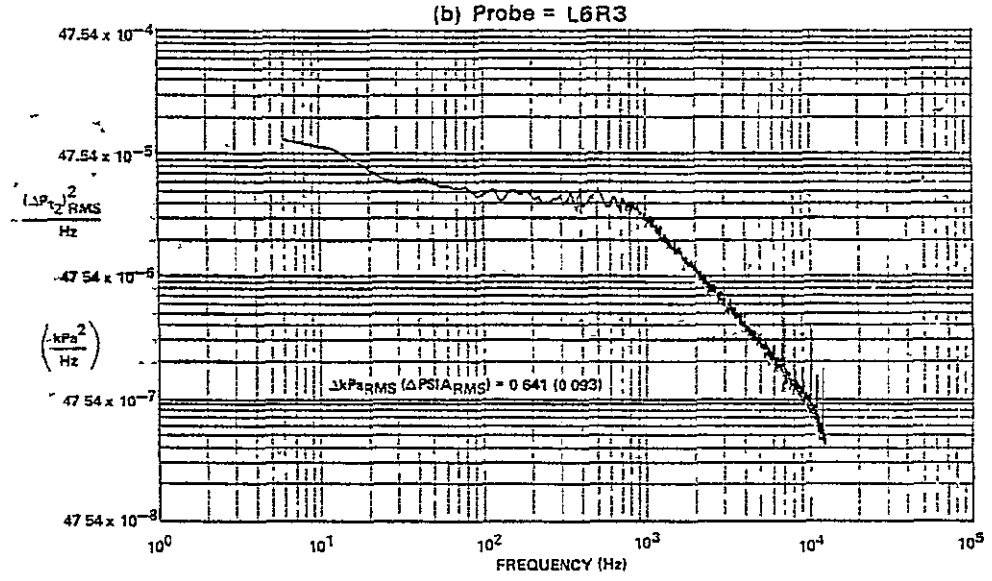


FIGURE D-10
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 1.8, α = —2, β = 0, WAT2 = 80.5%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 15/9 IDENT 45 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 02 03 15 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3 0	17 4	0 0	80 5%	—25 0

1 PSIA = 6.8948 kPa

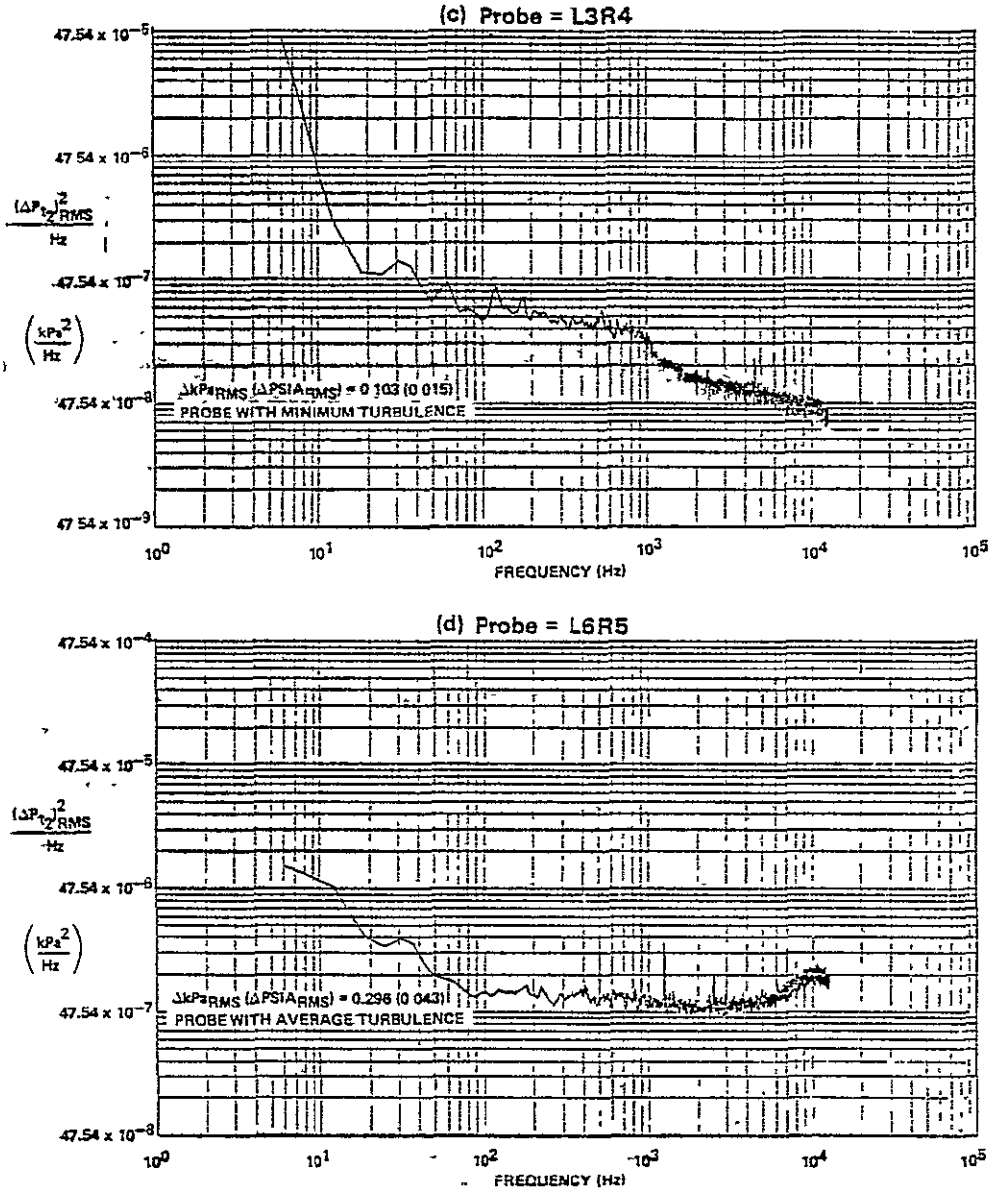


FIGURE D-10 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.8, α = —2, β = 0, WAT2 = 80.5%

DATA PART/POINT 15/5 IDENT 46 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 01 57 37 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	−2	0	−3.0	17 4	0 0	91 0%	−17 6

1 PSIA = 6 8948 kPa

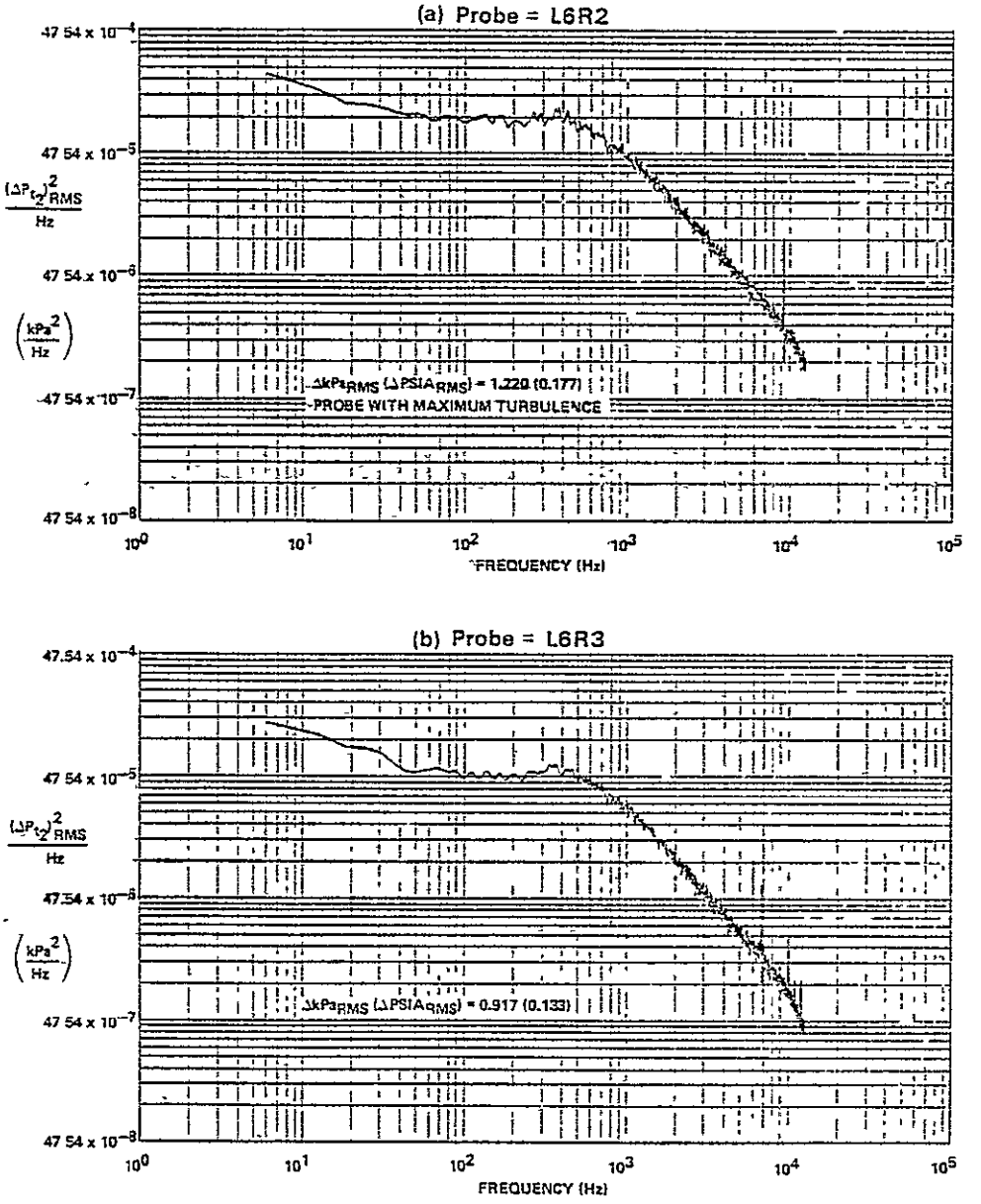


FIGURE D-11
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 1.8, α = −2, β = 0, WAT2 = 91.0%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 15/5 IDENT 46 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 01-57 37 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1.8	—2	0	—3.0	17 4	0 0	91 0%	—17 6

1 PSIA = 6.8948 kPa

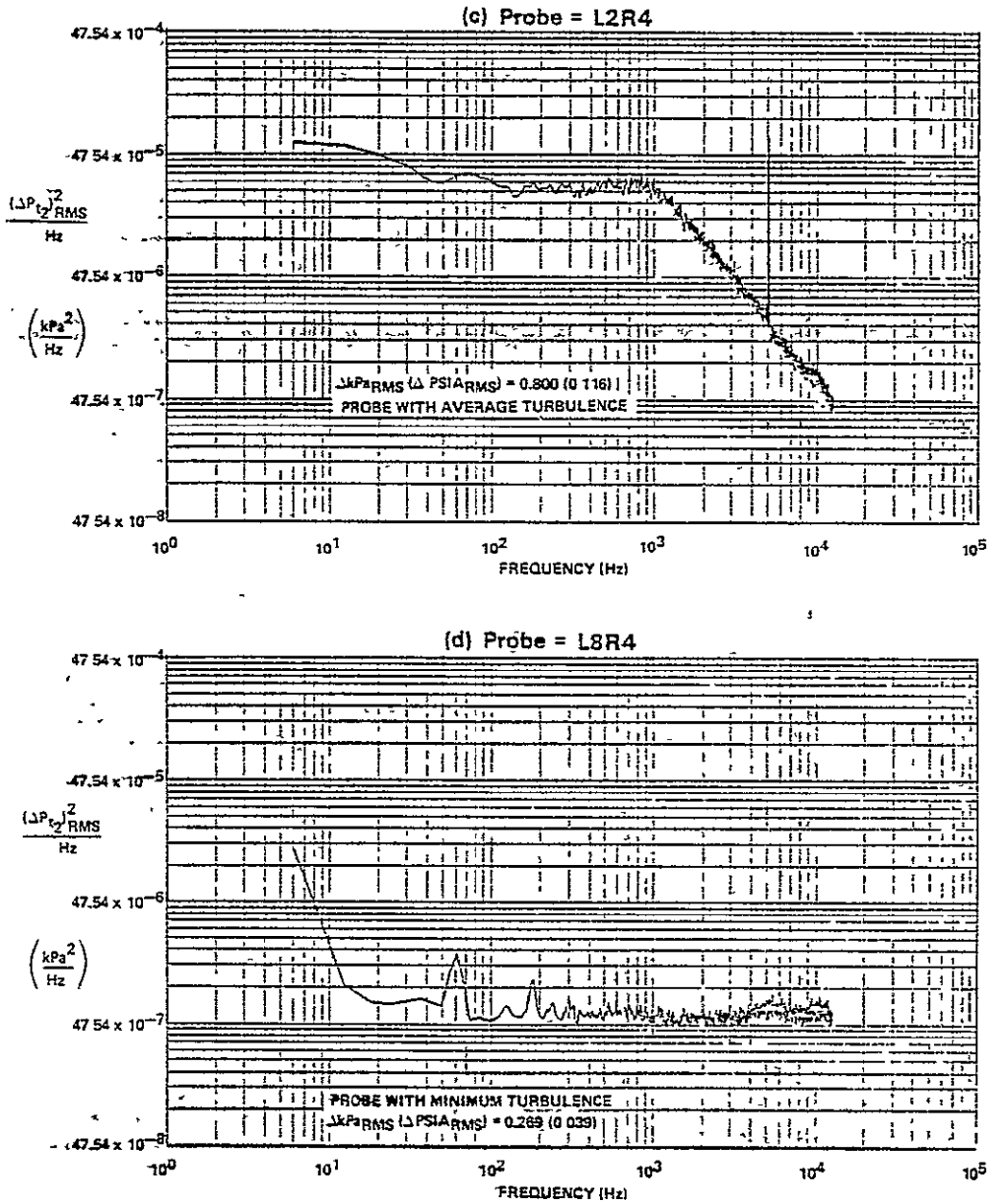


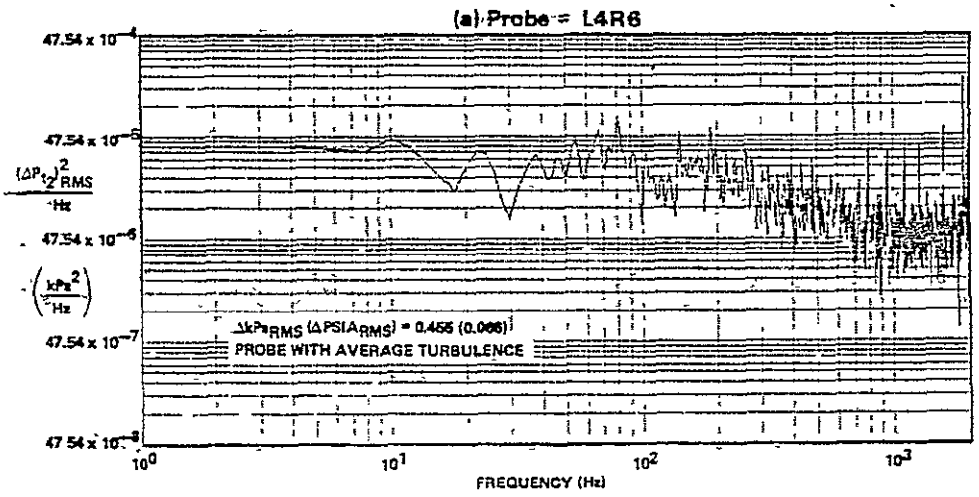
FIGURE D-11 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 91.0%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 415/1 IDENT 47 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 20 21 46 350
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
1 76	—2 6	0 5	17848 (58550)	—2 2	16'7	'0 0	80 7%	—25 000

1 PSIA = 6.8948 kPa



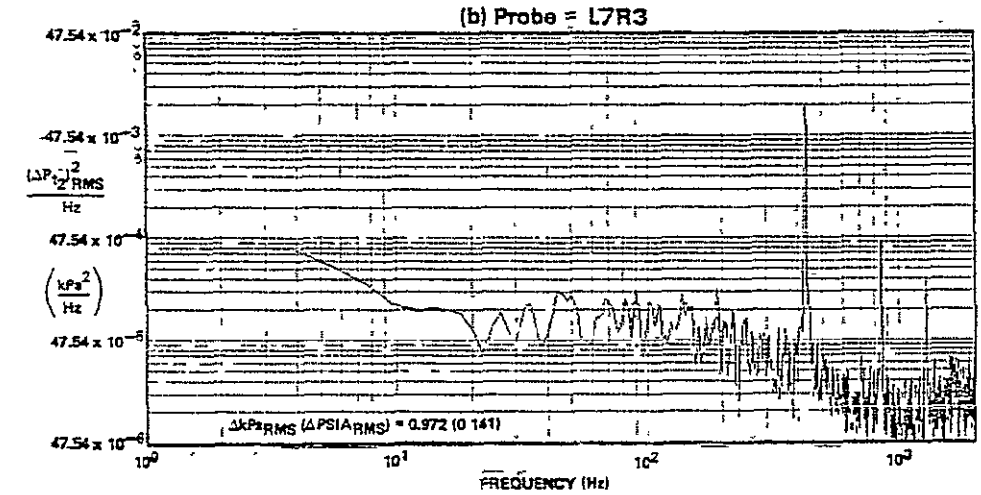


FIGURE D-12
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 1.76, α = —2.6, β = 0.5, WAT2 = 80.7%

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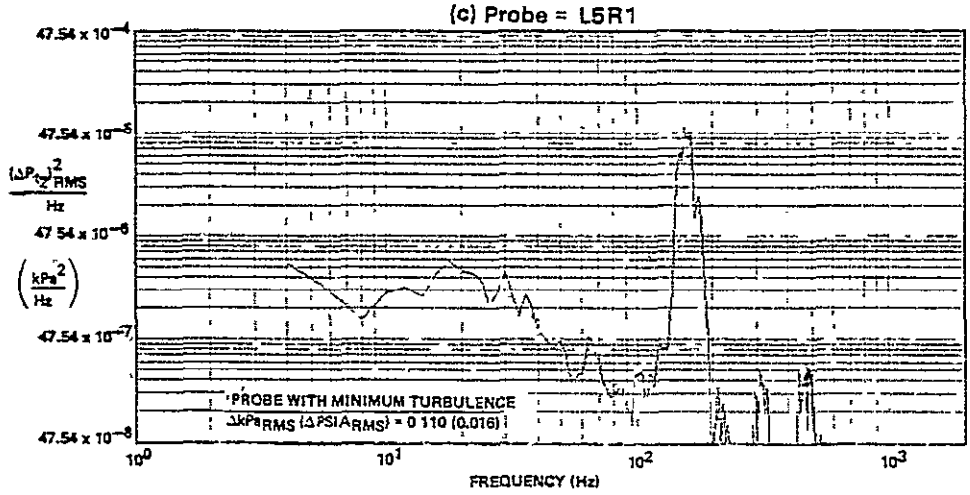
FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 415/1 IDENT 47 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 20 21 46 850
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
1 76	—2.6	0.5	17846 (58850)	—2 2	16 7	0 0	80 7%	—25 000

1 PSIA = 6.8948 kPa

(c) Probe = L5R1



(d) Probe = L8R3

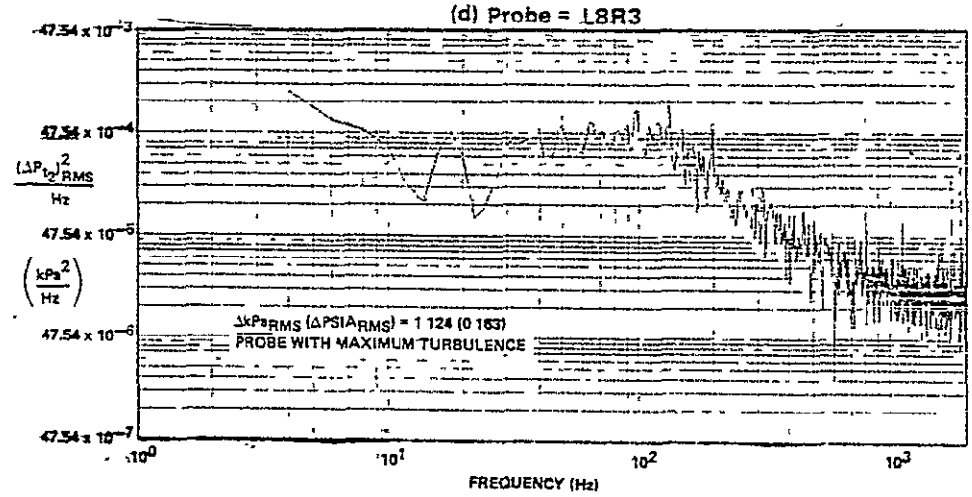


FIGURE D-12 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_D = 1.76$, $\alpha = -2.6$, $\beta = 0.5$, WAT2 = 80.7%

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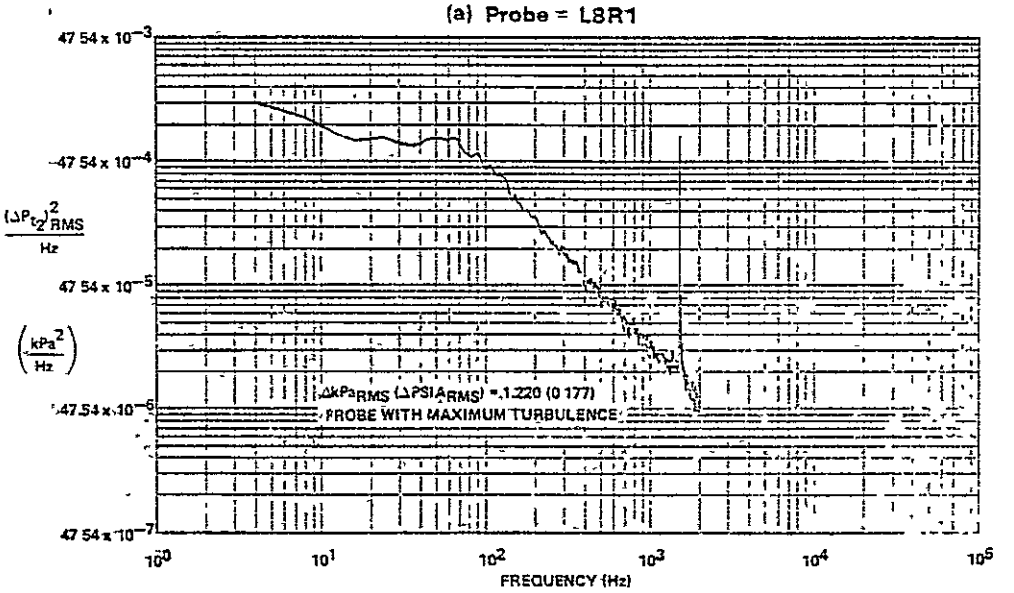
FSCP - NASA DATA STUDY

DATA PART/POINT 353/15 IDENT 48 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 42 01 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3 0	18 7	0 0	75 1%	—25 0

1 PSIA = 6.8948 kPa

(a) Probe = L8R1



(b) Probe = L2R3

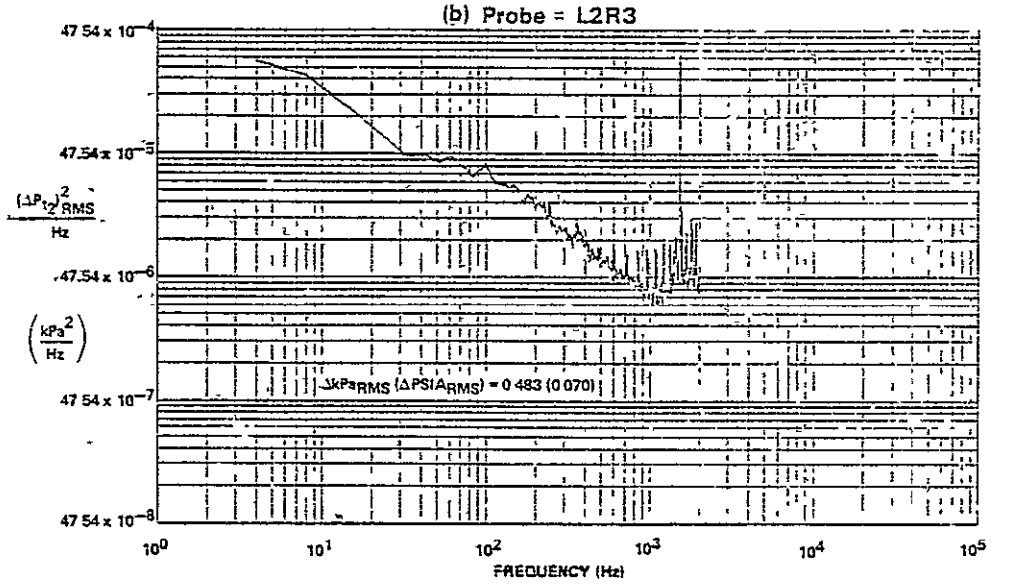
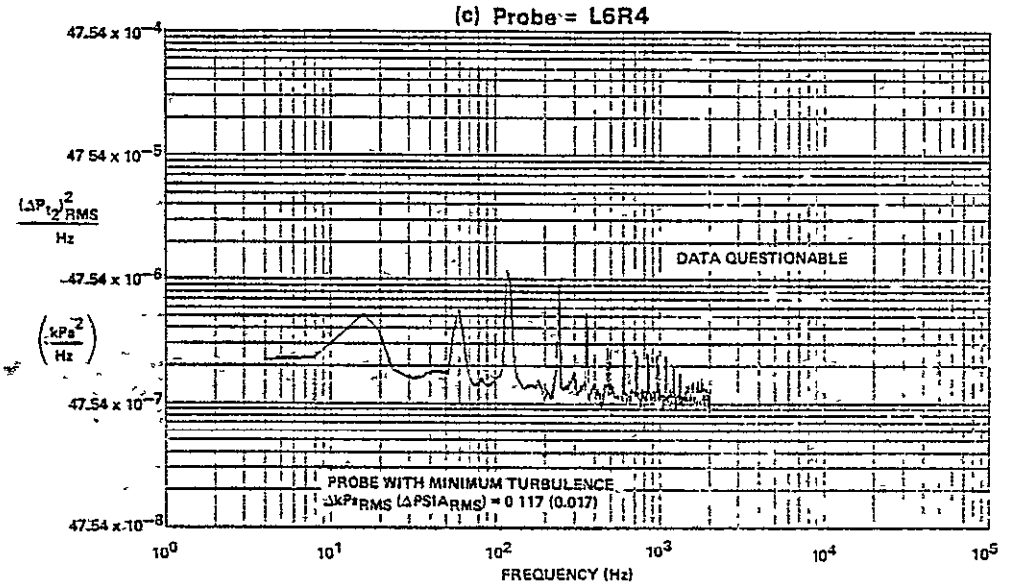


FIGURE D-13
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 75.1%

DATA PART/POINT 353/15 IDENT 48 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 42 01 000
BANDWIDTH = 7.9 Hz RECORD LENGTH = 13.0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1.8	—2	0	—3 0	18 7	0 0	75 1%	—25 0

1 PSIA = 6.8948 kPa



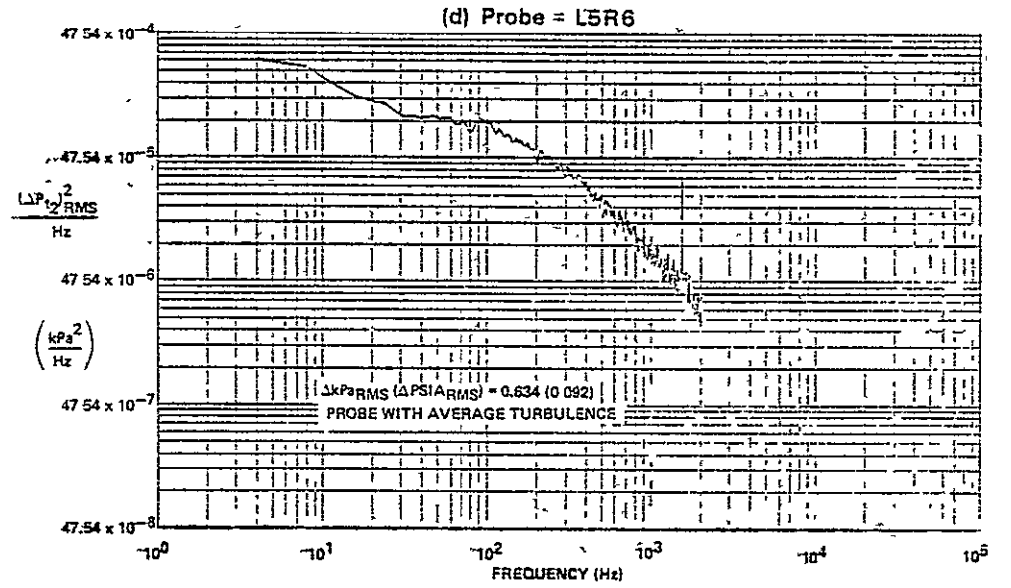


FIGURE D-13 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 75.1%

DATA PART/POINT 353/5 IDENT 49 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 27 21 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3 0	18 7	0 0	82 2%	—25 0

1 PSIA = 6 8948 kPa

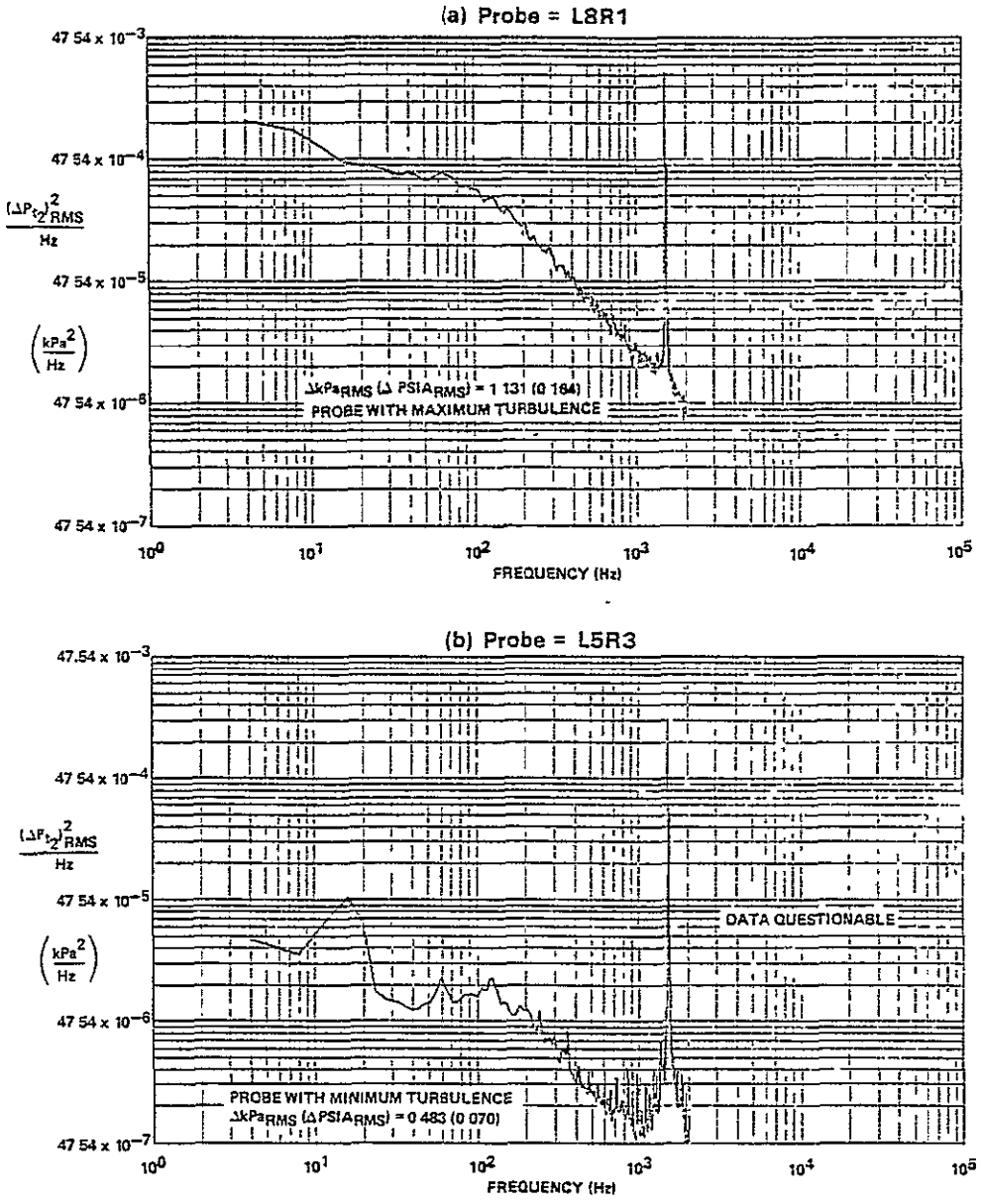


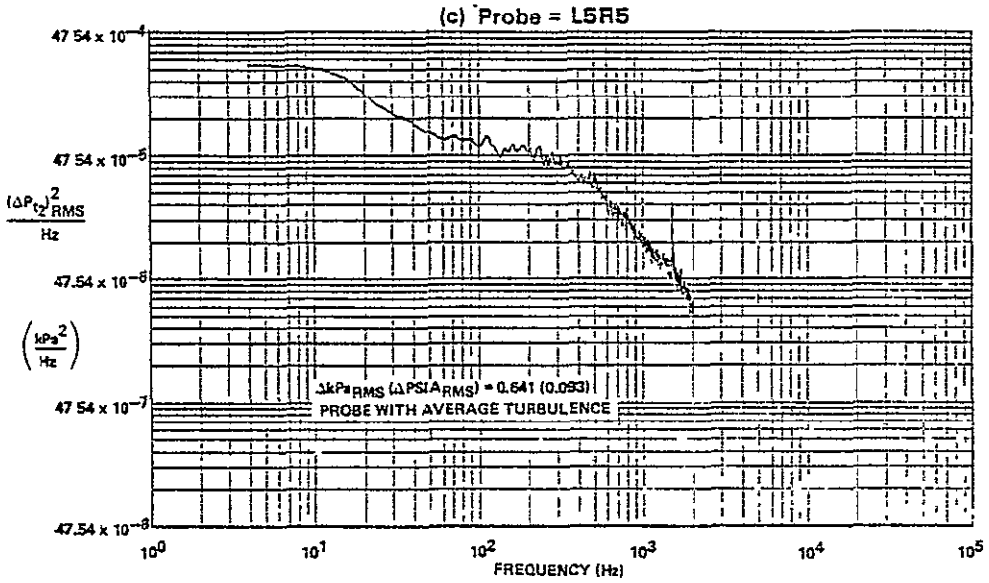
FIGURE D-14
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 82.2%

DATA PART/POINT 353/5 IDENT. 49 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 27 21 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1.8	—2	0	—3 0	18 7	0 0	82 2%	—25 0

1 PSIA = 6.8948 kPa

(c) Probe = L5R5



(d) Probe = L8R3

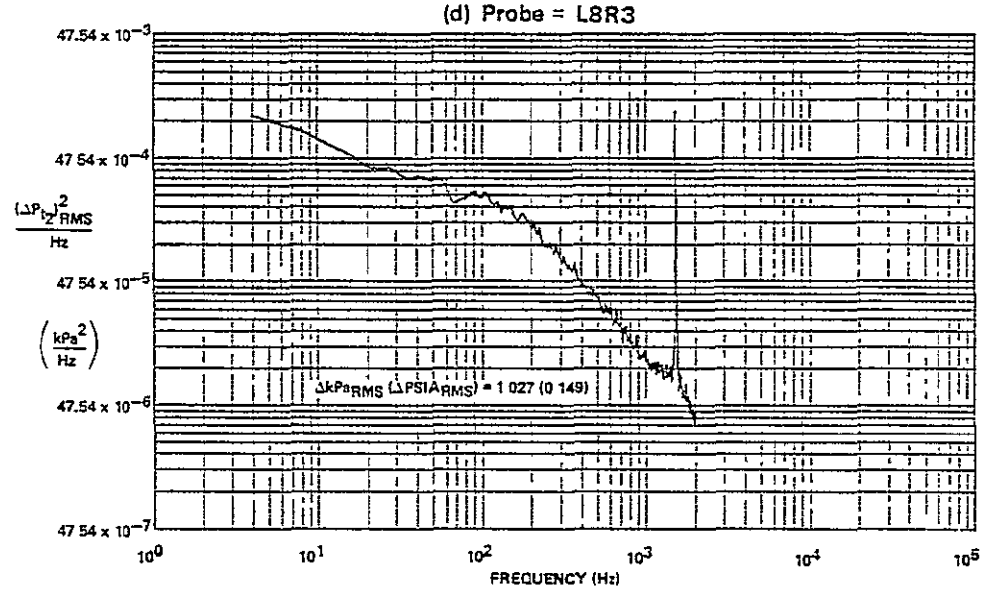


FIGURE D-14 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.8, α = —2, β = 0, WAT2 = 82.2%

DATA PART/POINT 353/12 IDENT 50 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 38 18 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3 0	18 7	0 0	85 4%	—23 9

1 PSIA = 6 8948 kPa

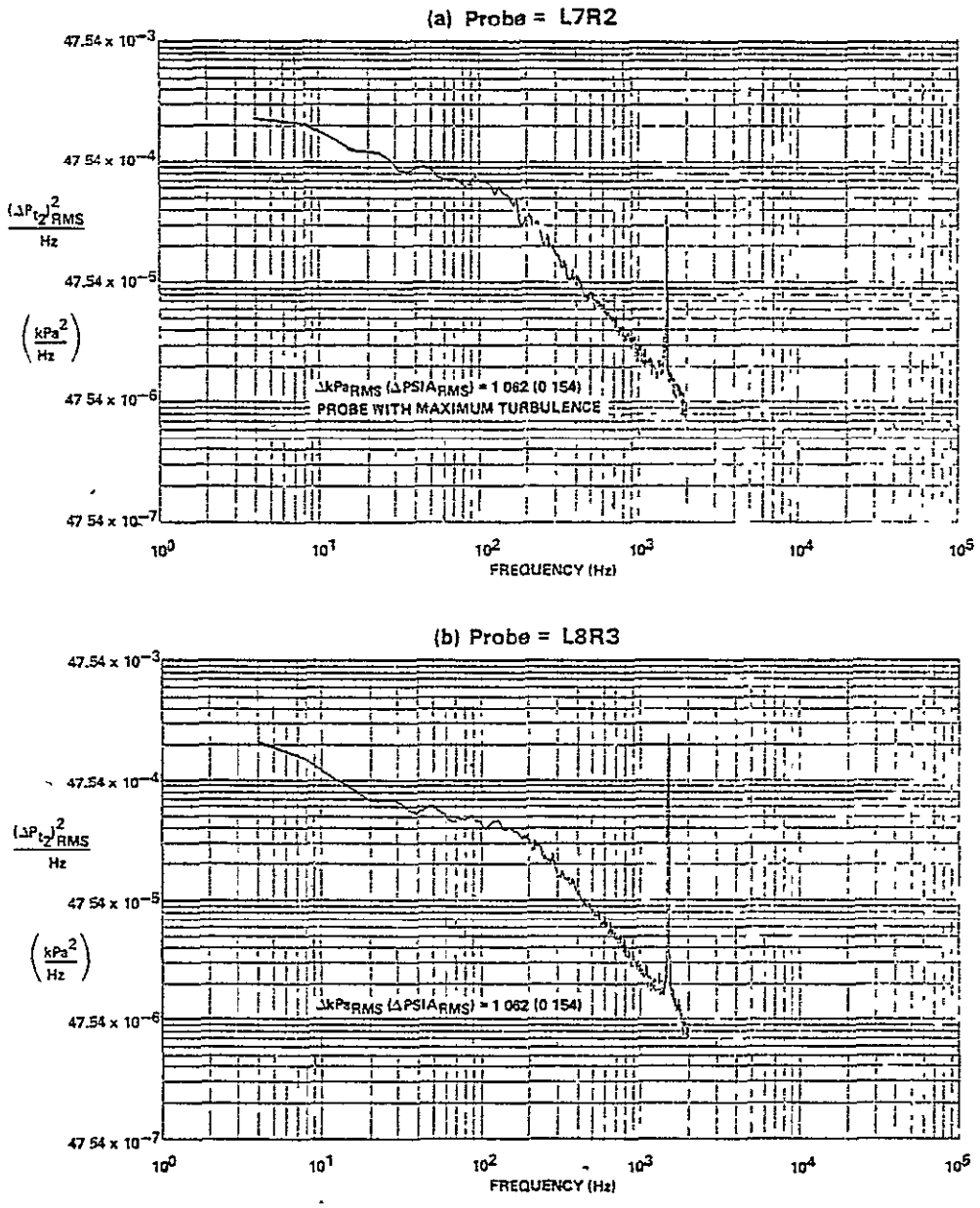


FIGURE D-15
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 1.8, α = —2, β = 0, WAT2 = 85.4%

FSCP - NASA DATA STUDY

DATA PART/POINT 353/12 IDENT 50 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 38 18 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—3.0	18.7	0 0	85 4%	—23 9

1 PSIA = 6.8948 kPa

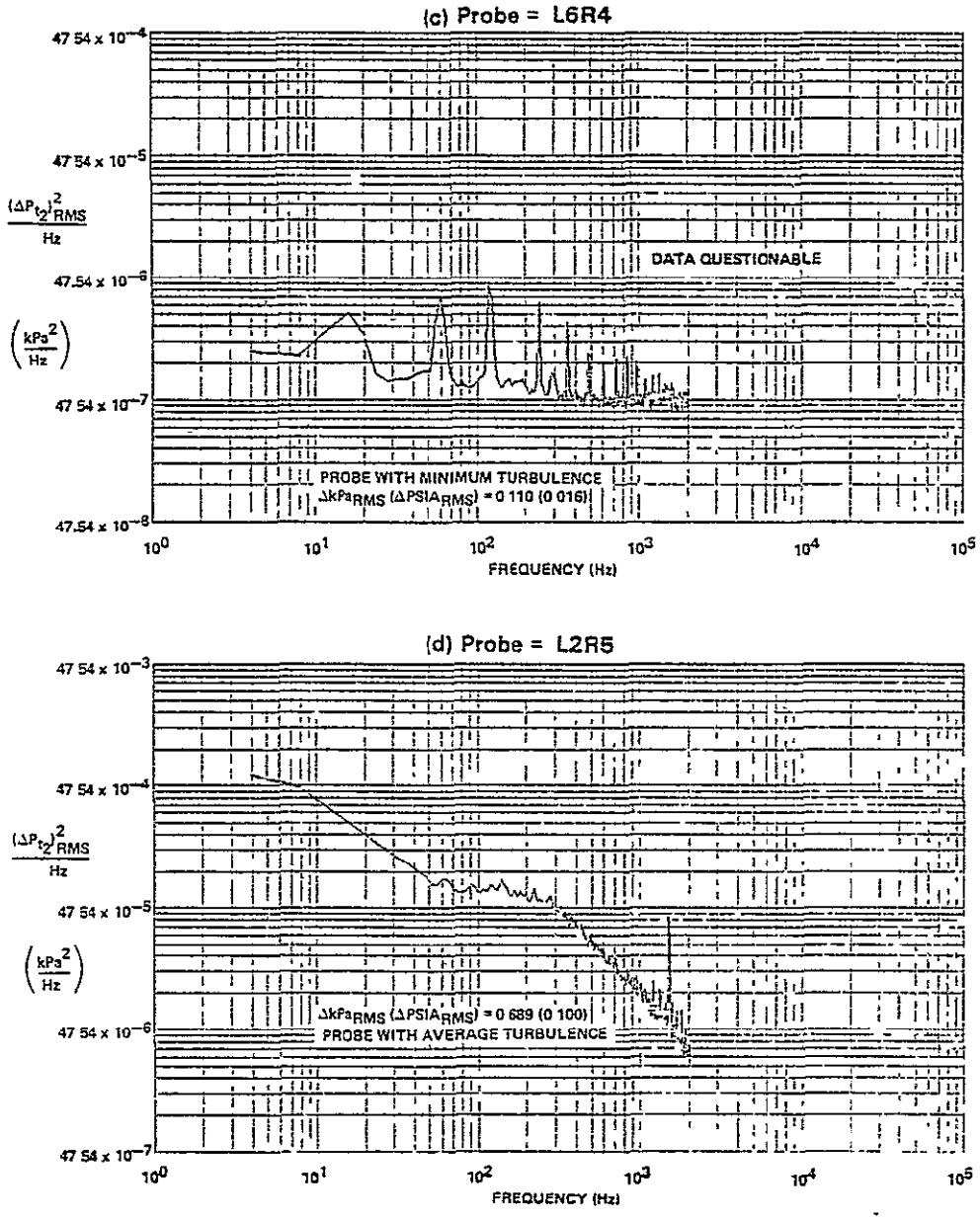


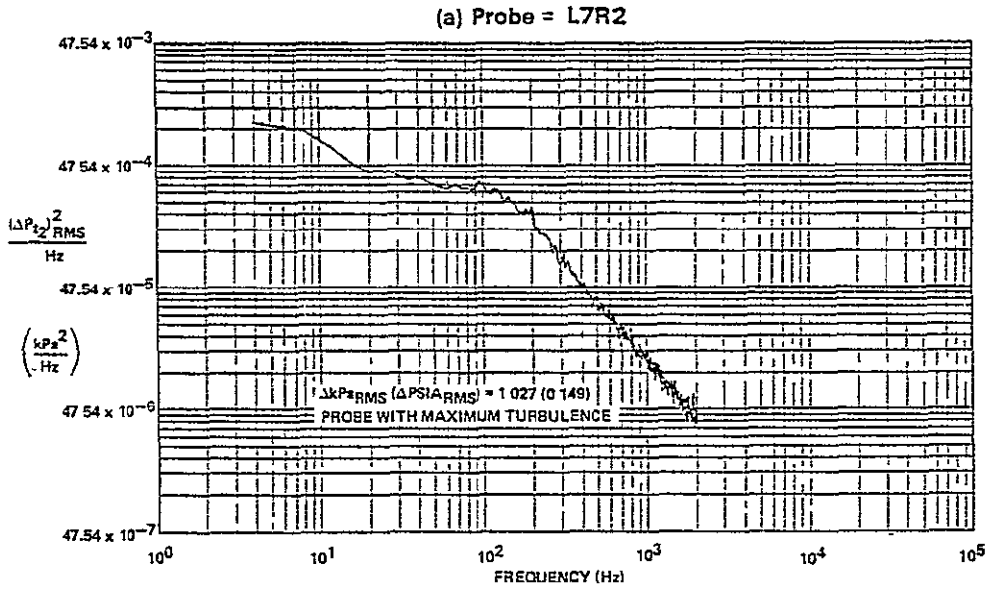
FIGURE D-15 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 85.4%

FSE - NASA DATA STUDY

DATA PART/POINT 523/2 IDENT 51 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 02 45 27 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—2 9	18 6	0 0	80 6%	—25 0

1 PSIA = 6 8948 kPa



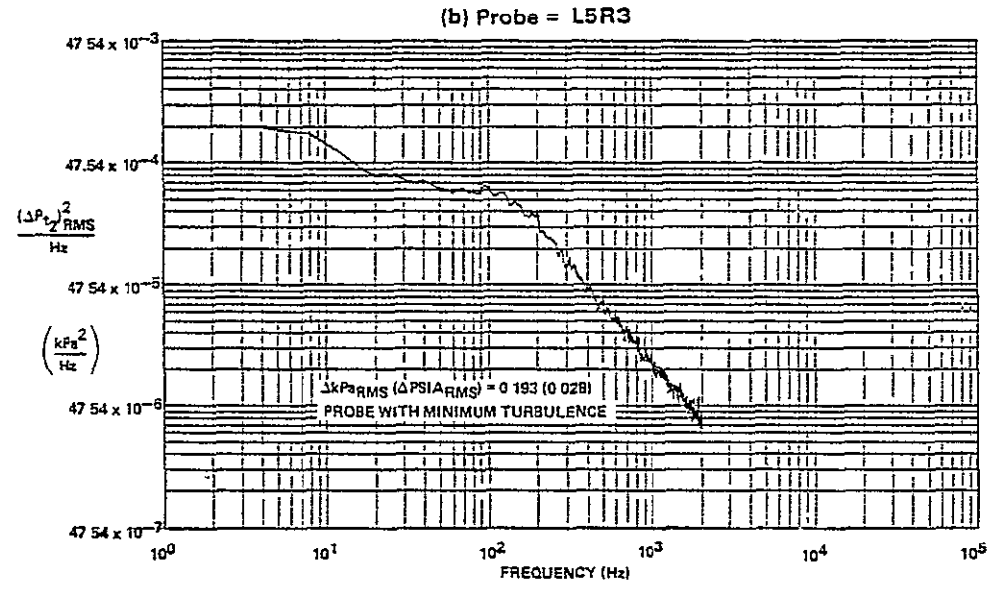


FIGURE D-16
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.8, α = —2, β = 0, WAT2 = 80.6%

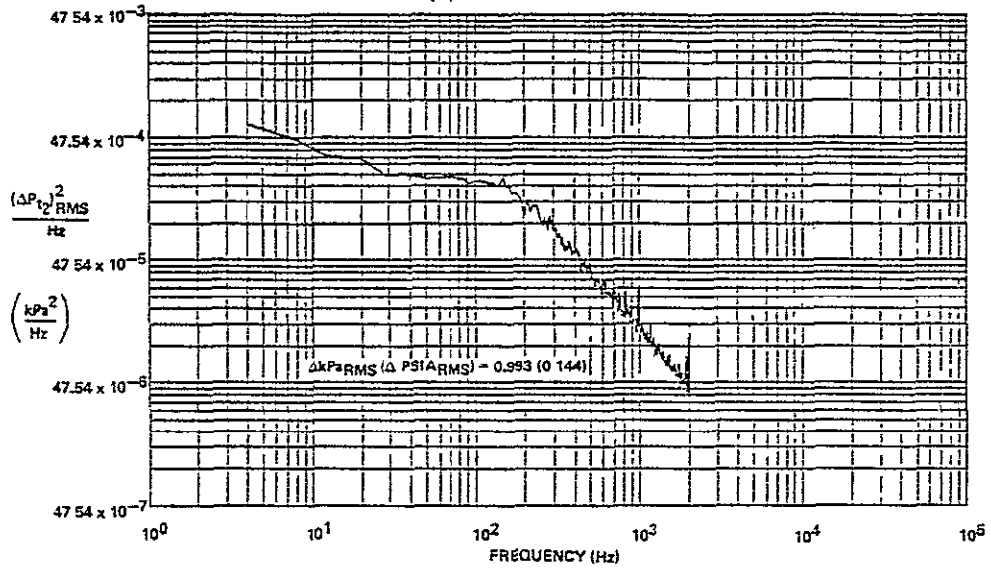
FSE - NASA DATA STUDY

DATA PART/POINT 523/2 IDENT 51 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 02 46 27 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—2 9	18 6	0 0	80 6%	—25 0

1 PSIA = 6.8948 kPa

(c) Probe = L8R3



(d) Probe = L3R4

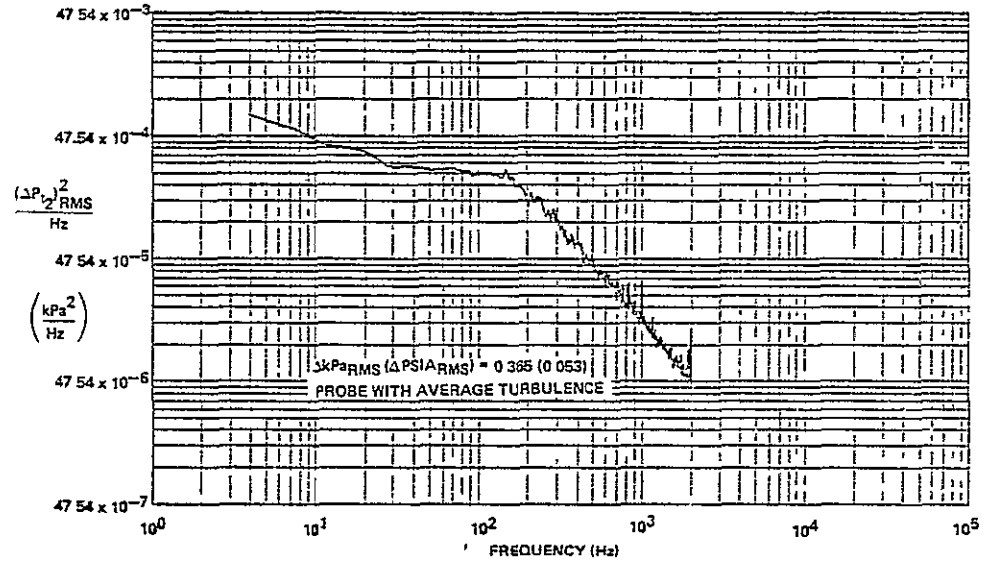


FIGURE D-16 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 1.8, α = —2, β = 0, WAT2 = 80.6%

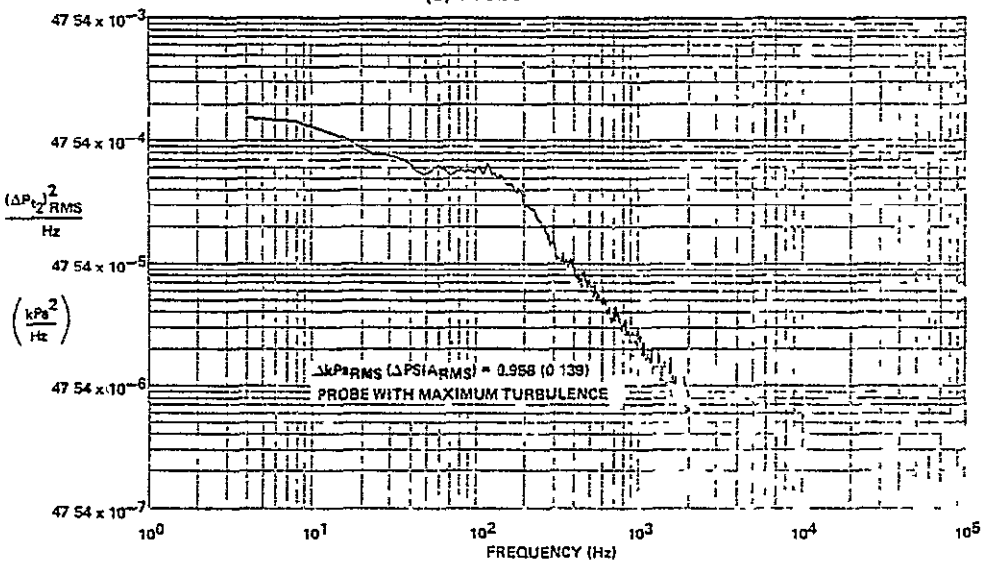
FSE - NASA DATA STUDY

DATA PART/POINT 625/4 IDENT 52 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 03 18 32 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—2 9	18 6	0 0	79 8%	—25 0

1 PSIA = 6.8948 kPa

(a) Probe = L7R2



(b) Probe = L5R3

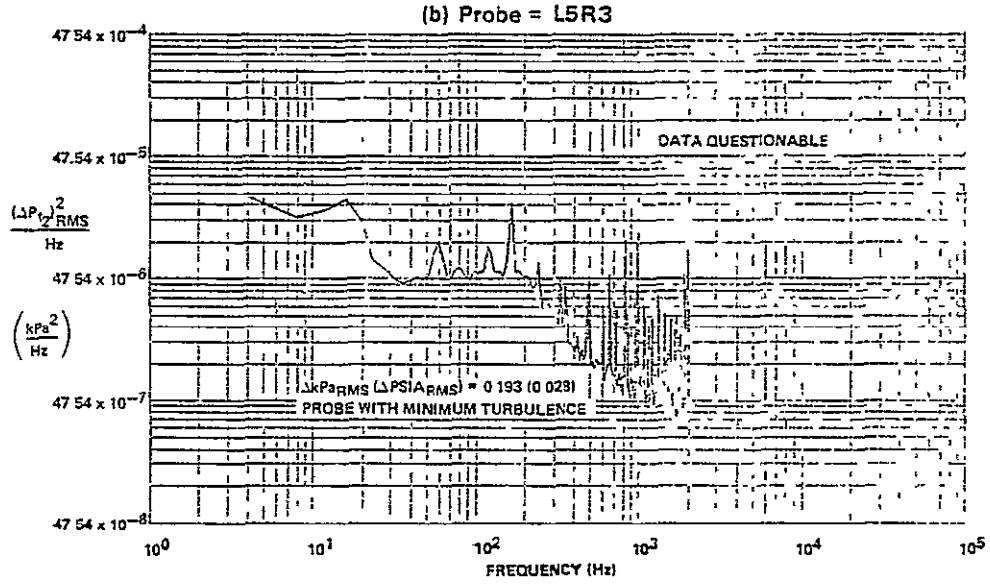


FIGURE D-17
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.8, α = —2, β = 0, WAT2 = 79.8%

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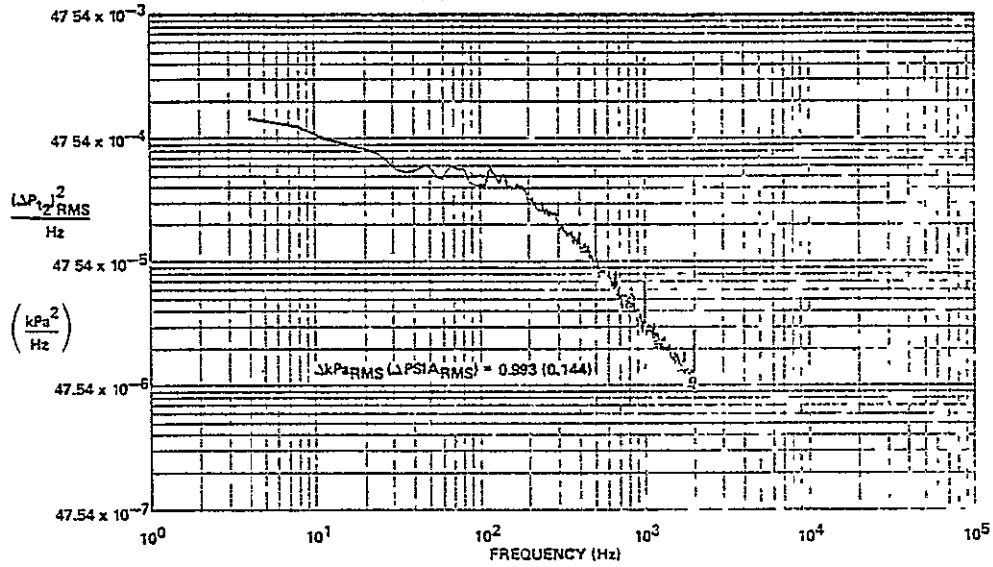
FSE - NASA DATA STUDY

DATA PART/POINT 525/4 IDENT 52 FREQUENCY RANGE = 4 — 2024
THE SEGMENT START TIME WAS AT 03 18 32 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	—2	0	—2 9	18 6	0 0	79 8%	—25 0

1 PSIA = 6.8948 kPa

(c) Probe = L8R3



(d) Probe = L4R6

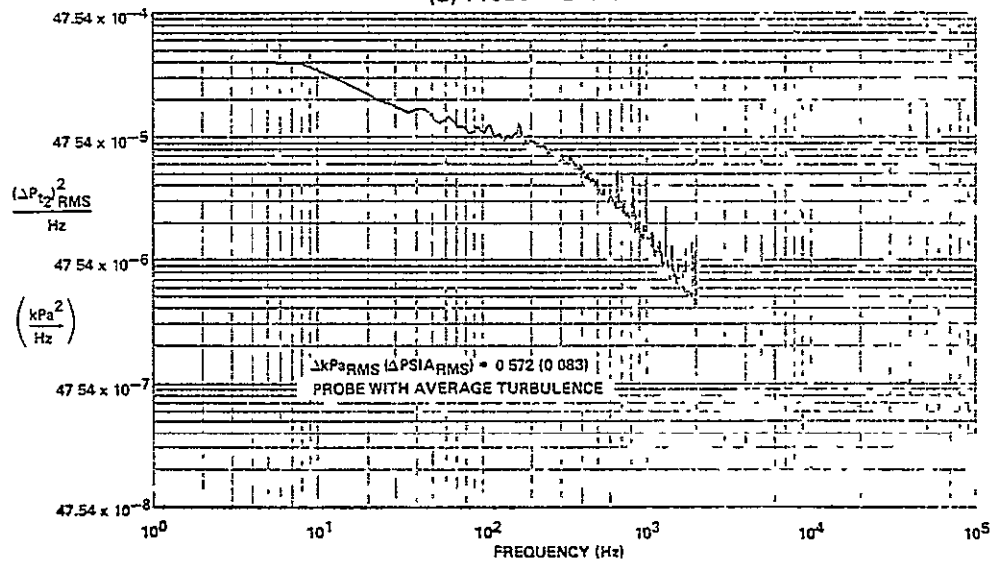


FIGURE D-17 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = -2$, $\beta = 0$, WAT2 = 79.8%

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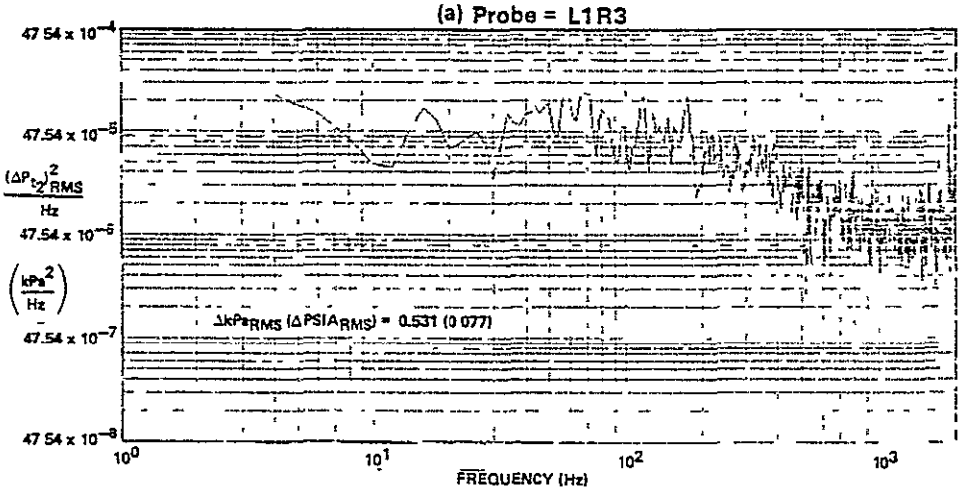
FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 416/1 IDENT 53 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 16 09 18 400
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT -	RHO	DELTA3	BYPASS	WAT2	CIVV
1 81	—2 3	0.2	17511 (57450	—2 8	18 2	0 0	78 9%	—25 000

1 PSIA = 6.8948 kPa



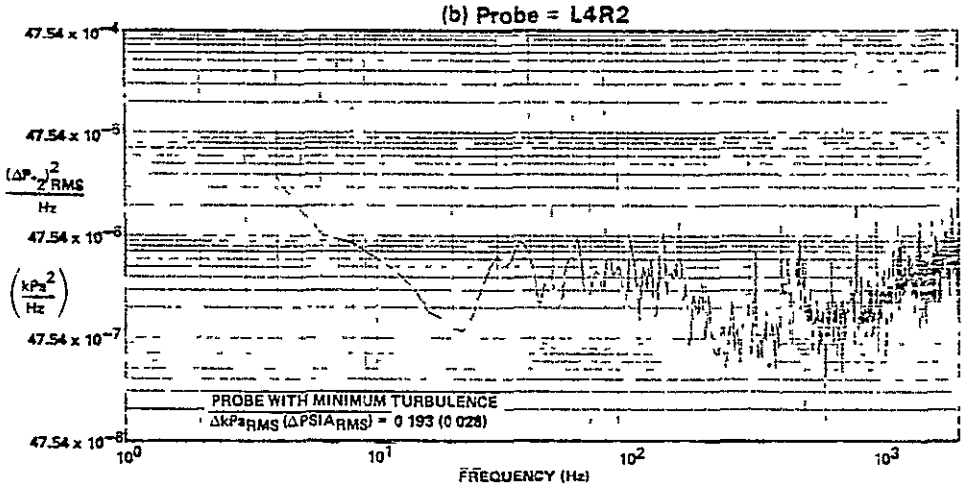


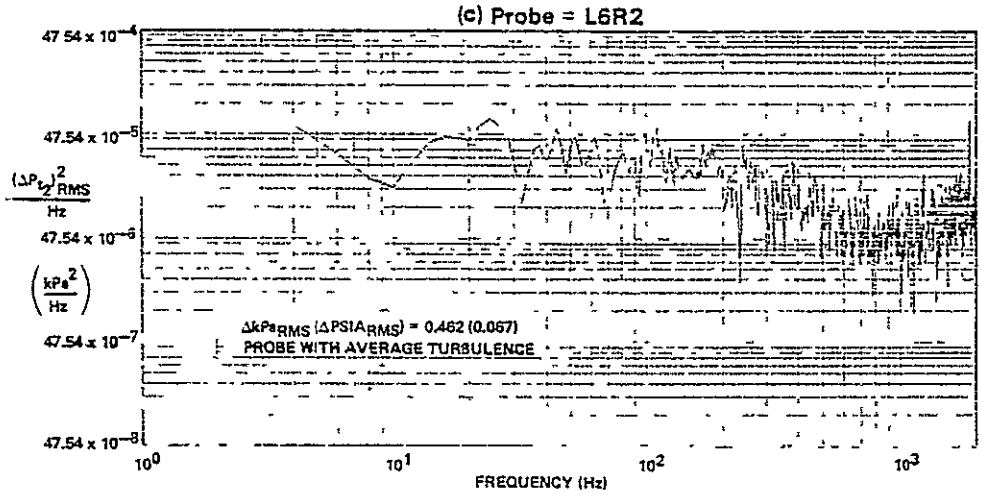
FIGURE D-18
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 1.81$, $\alpha = -2.3$, $\beta = 0.2$, WAT2 = 78.9%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 416/1 IDENT 53 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 16 09 18 400
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
1 81	—2 3	0 2	17511 (57460	—2 8	18 2	0 0	78 9%	—25 000

1 PSIA = 6.8948 kPa



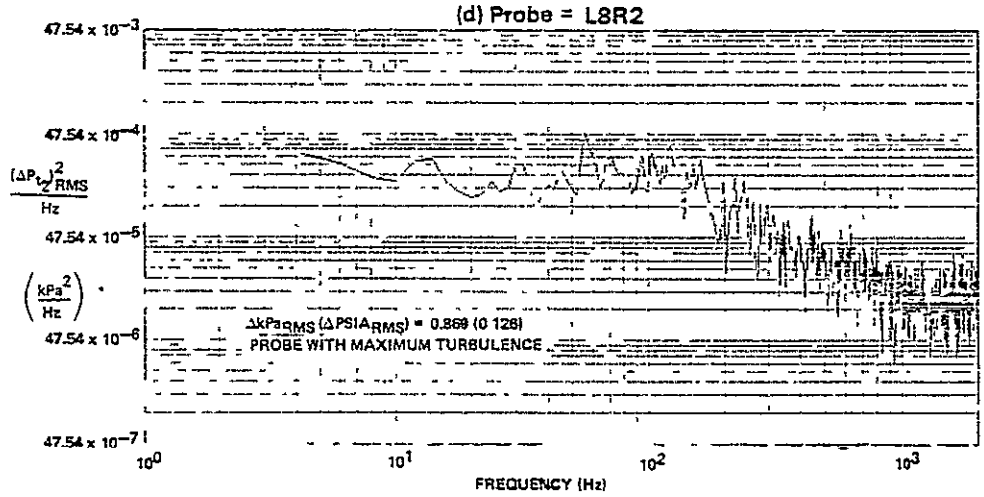


FIGURE D-18 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.81, α = —2.3, β = 0.2, WAT2 = 78.9%

DATA PART/POINT 355/8 IDENT 54 FREQUENCY RANGE = 4 — 2024
THE SEGMENT START TIME WAS AT 01 40 03 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	79 9%	−25 0

1 PSIA = 6 8948 kPa

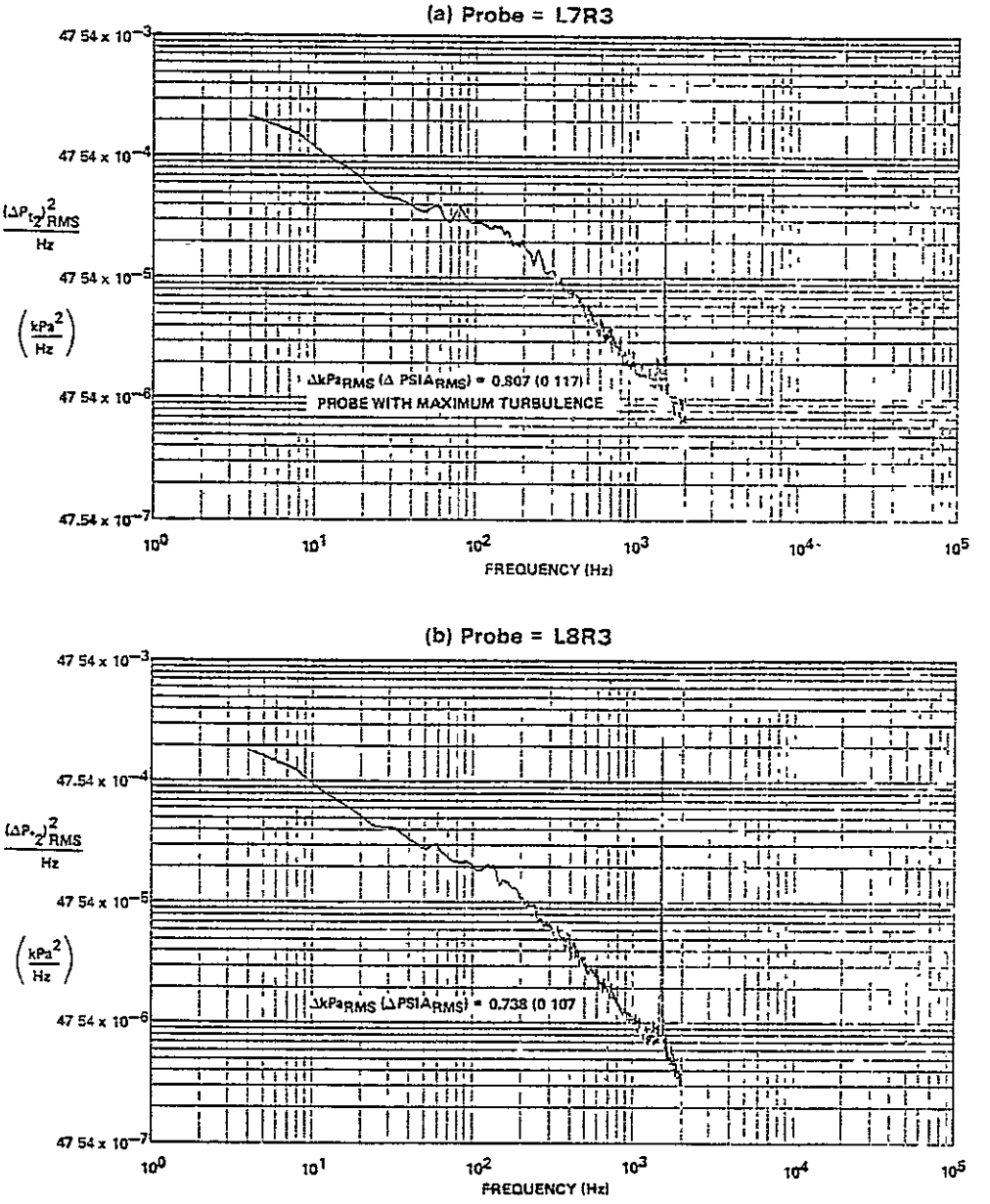


FIGURE D-19
POWER SPECTRAL DENSITY PLOTS FOR
$M_0 = 1.8$, $\alpha = 4$, $\beta = 0$, WAT2 = 79.9%

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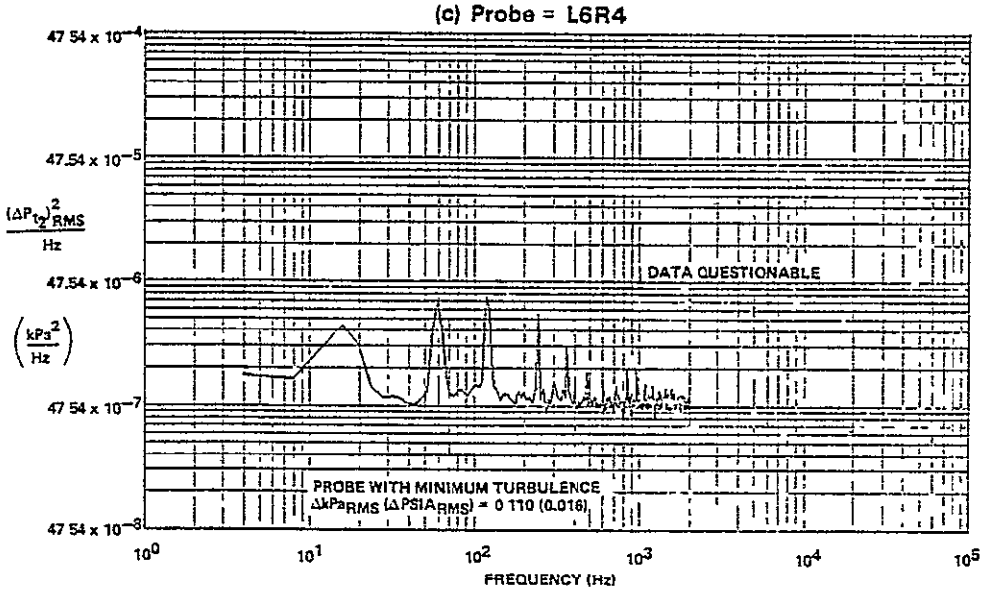
DATA PART/POINT 355/8 IDENT 54 FREQUENCY RANGE = 4 — 2024
THE SEGMENT START TIME WAS AT 01 40 03 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	79 9%	—25 0

1 PSIA = 6.8948 kPa

(c) Probe = L6R4



(d) Probe = L2R5

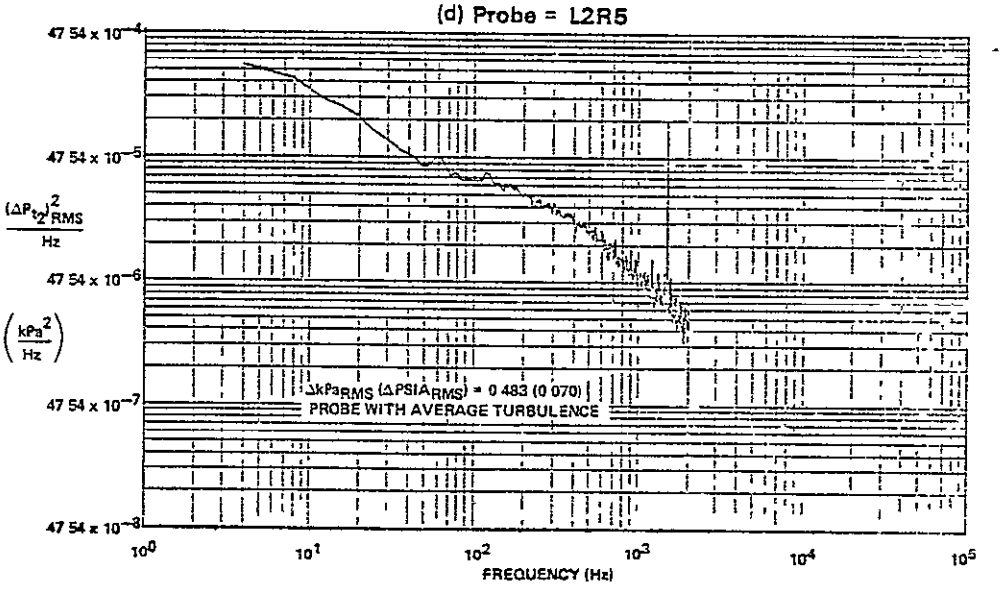


FIGURE D-19 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 1.8$, $\alpha = 4$, $\beta = 0$, WAT2 = 79.9%

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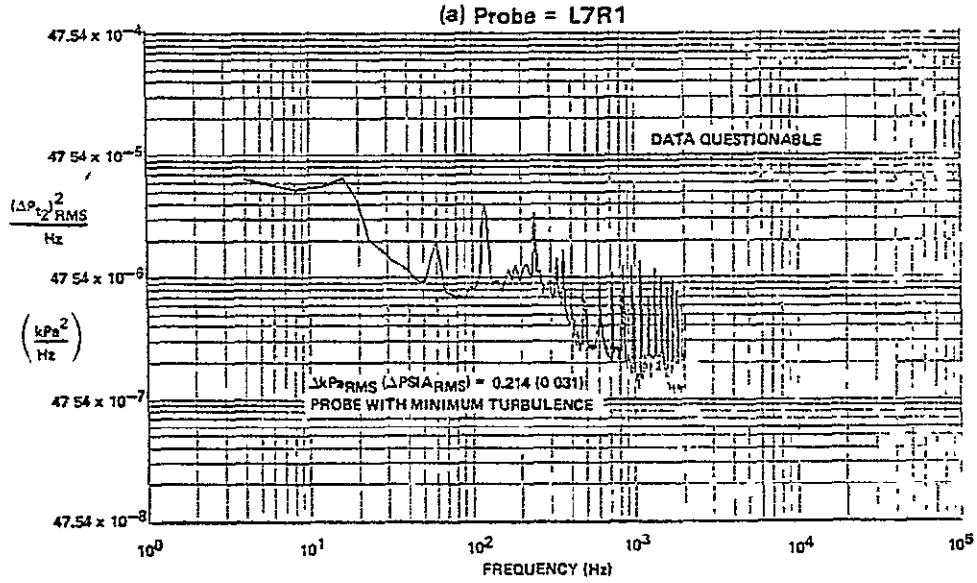
FSE - NASA DATA STUDY

DATA PART/POINT 528/2 IDENT 55 FREQUENCY RANGE = 4 — 2024
THE SEGMENT START TIME WAS AT 03 40 36 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	80 8%	—25 0

1 PSIA = 6 8948 kPa

(a) Probe = L7R1



(b) Probe = L8R3

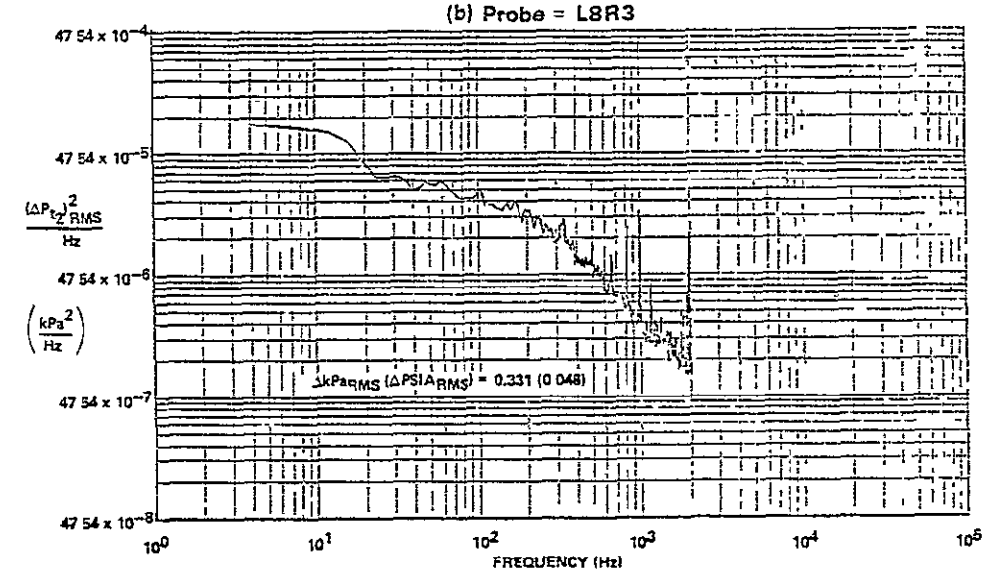


FIGURE D-20
POWER SPECTRAL DENSITY PLOTS FOR
$M_0 = 1.8$, $\alpha = 4$, $\beta = 0$, WAT2 = 80.8%

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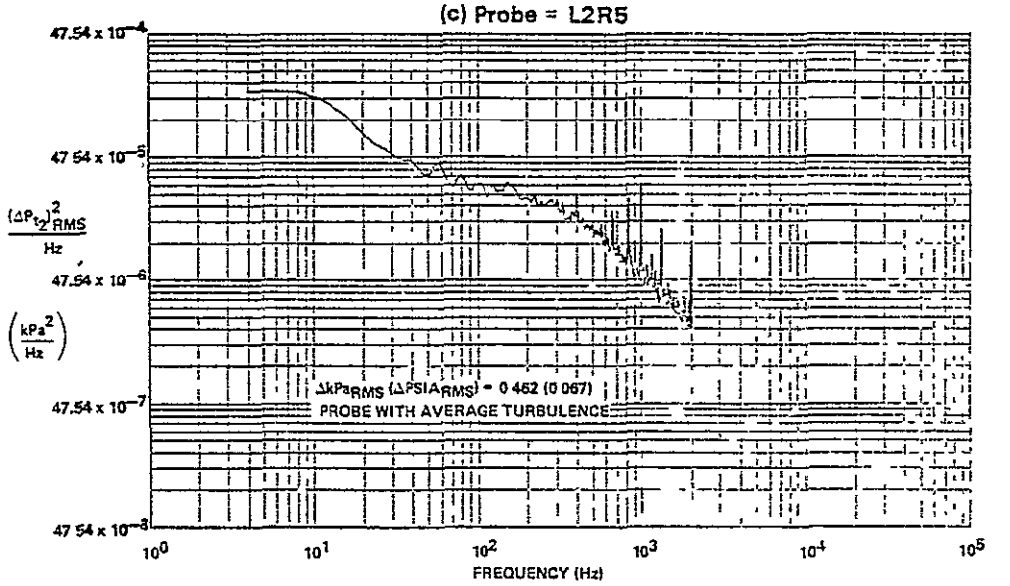
FSE - NASA DATA STUDY

DATA PART/POINT 528/2 IDENT 55 FREQUENCY RANGE = 4 — 2024
THE SEGMENT START TIME WAS AT 03 40 36 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	80 8%	—25 0

1 PSIA = 6 8948 kPa

(c) Probe = L2R5



(d) Probe = L6R6

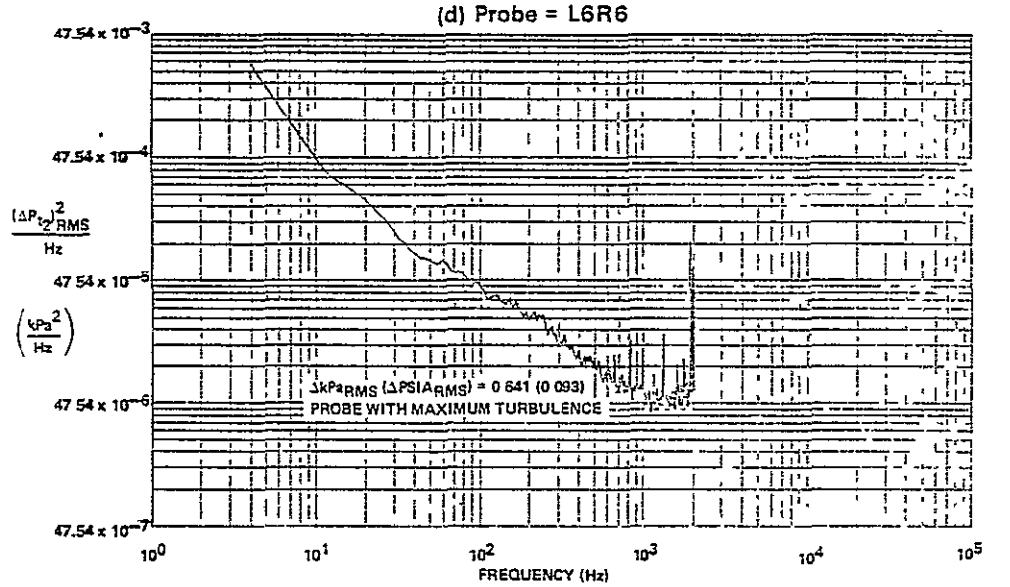


FIGURE D-20 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 1.8$, $\alpha = 4$, $\beta = 0$, WAT2 = 80.8%

FSE - NASA DATA STUDY

DATA PART/POINT 529/4 IDENT 56 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 04 25 48 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	79 7%	−25 0

1 PSIA = 6.8948 kPa

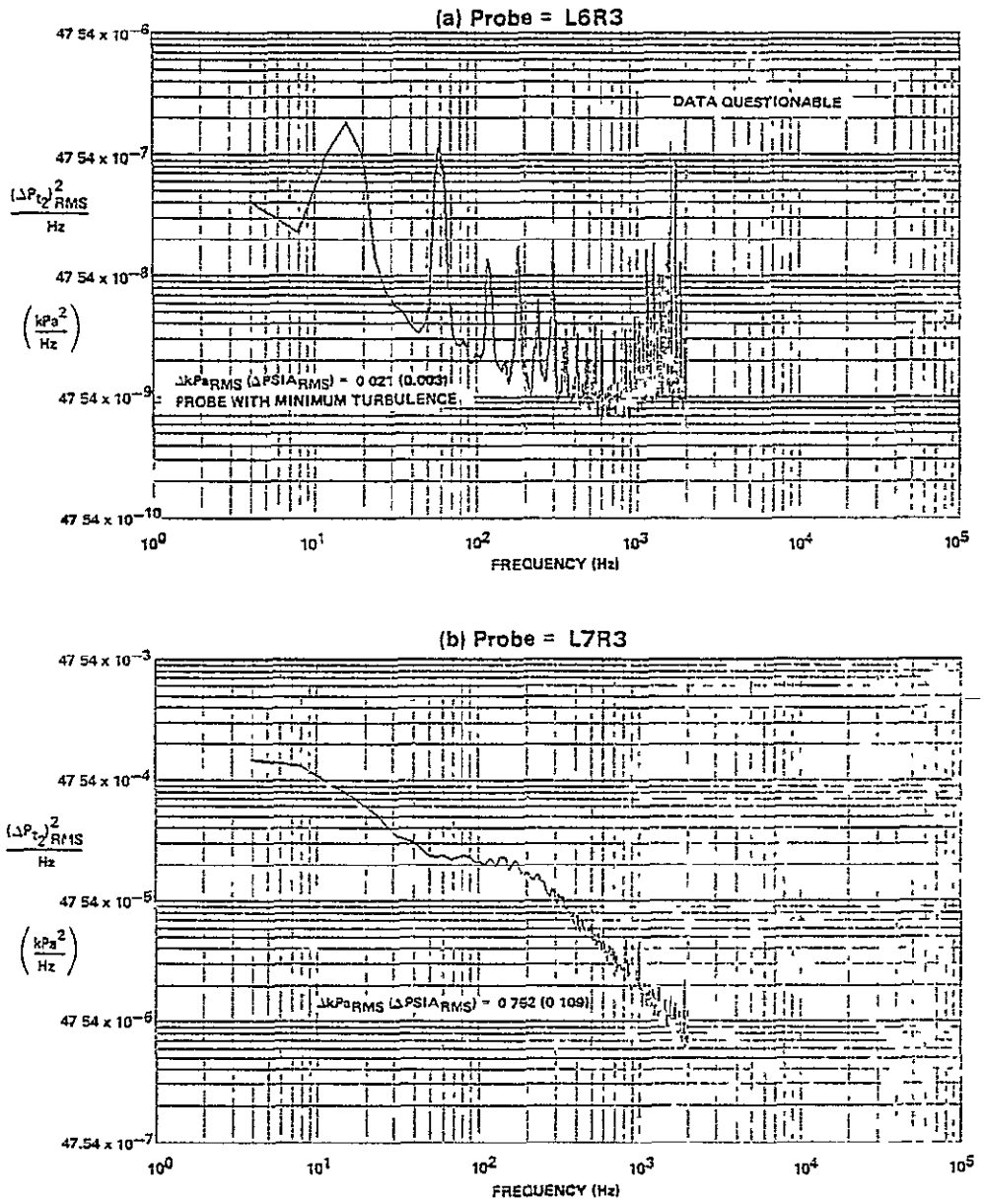


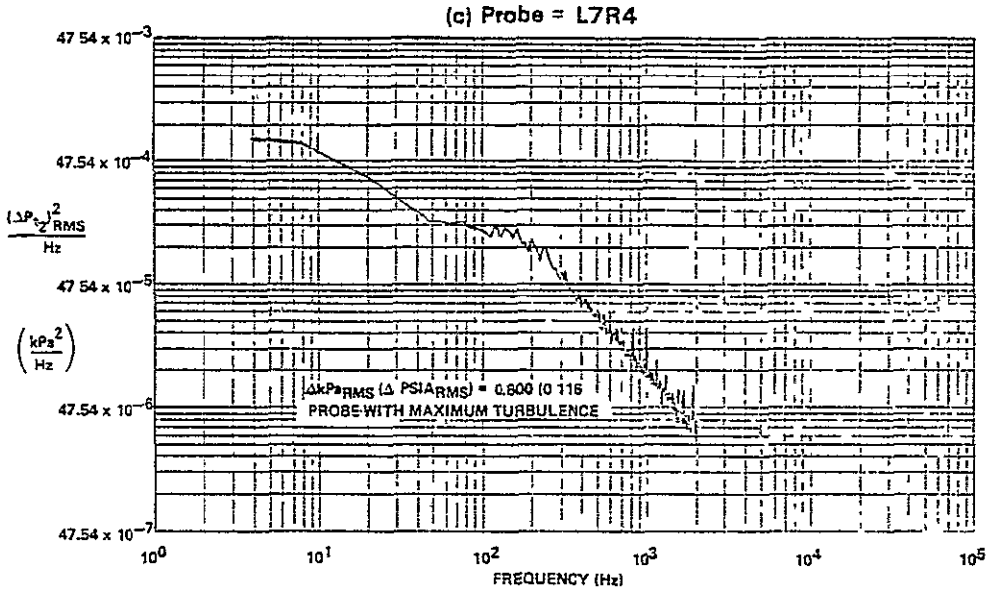
FIGURE D-21
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 1.8, α = 4, β = 0, WAT2 = 79.7%

FSE - NASA DATA STUDY

DATA PART/POINT 529/4 IDENT 56 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 04 25 48 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
1 8	4	0	2 5	18 7	0 0	79 7%	−25 0

1 PSIA = 6 8948 kPa



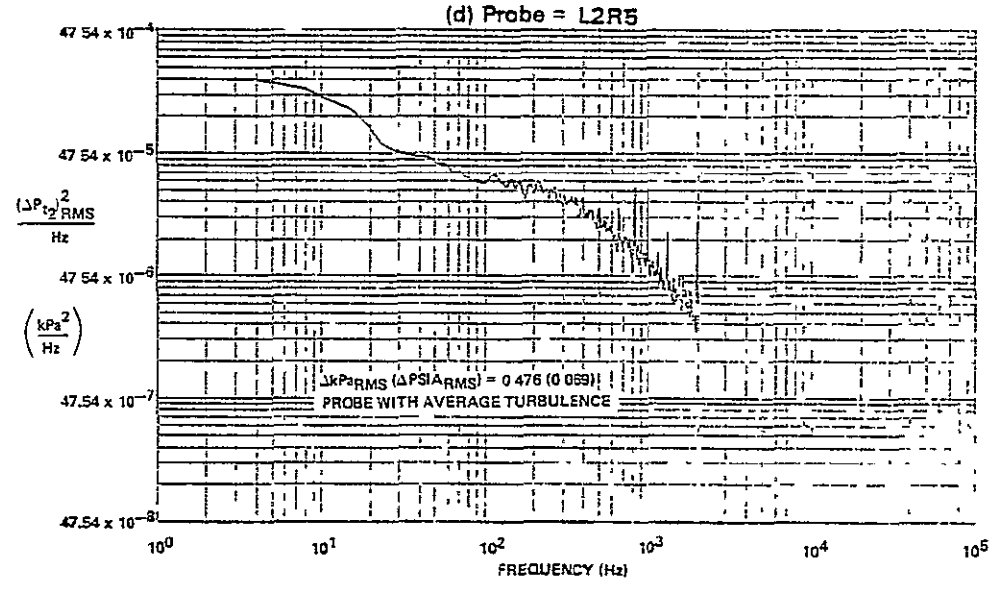


FIGURE D-21 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 1.8, α = 4, β = 0, WAT2 = 79.7%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 249/5 IDENT 60 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 06 15 59 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	−2	0	−4 0	25 0	0774 (120 0)	65 0%	−25 0

1 PSIA = 6 8948 kPa

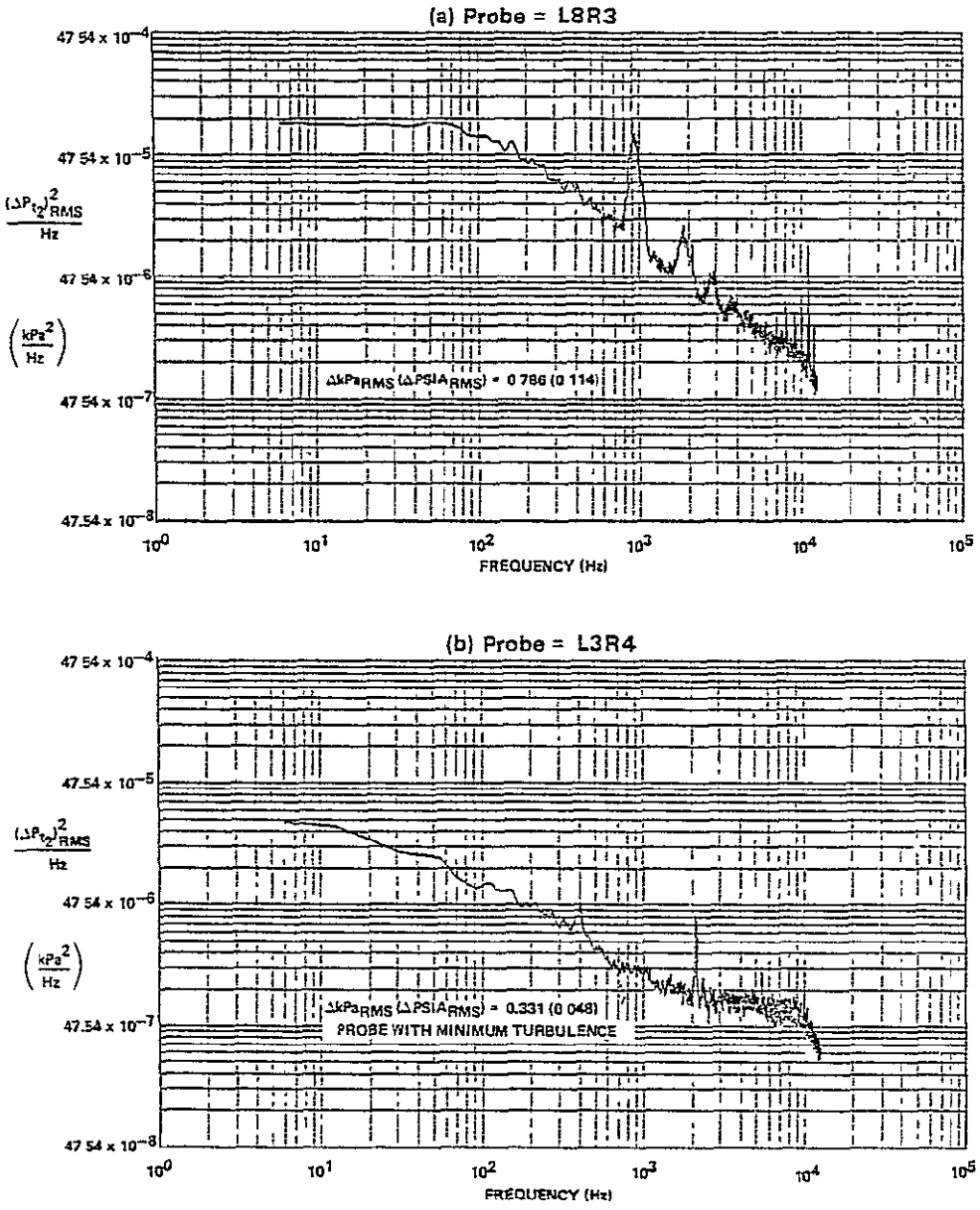


FIGURE D-22
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 65.0%

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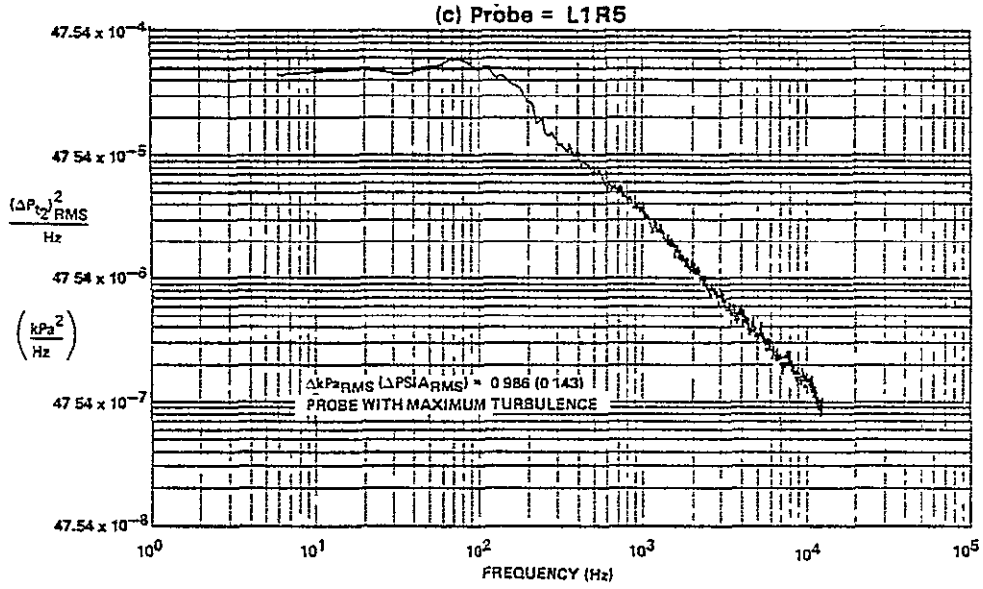
SERIES VIII - NASA DATA STUDY

DATA PART/POINT 249/6 IDENT 60 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 08 15 59 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	25 0	0774 (120 0)	65 0%	—25 0

1 PSIA = 6 8948 kPa



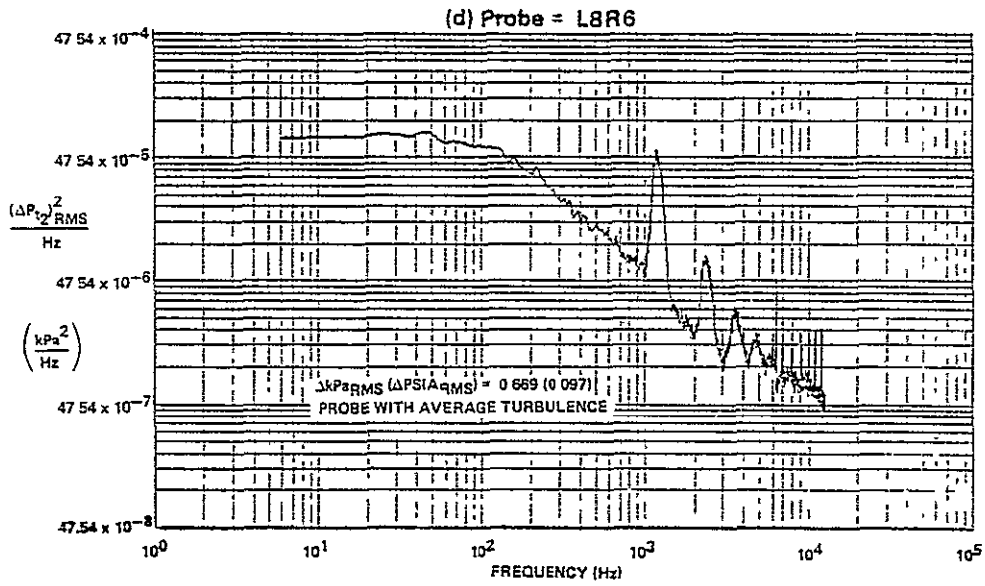


FIGURE D-22 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_0 = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 65.0%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 249/9 IDENT 61 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 06 21 10 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	−2	0	−4 0	25 0	0774 (120 0)	62 9%	−25 0

1 PSIA = 6 8948 kPa

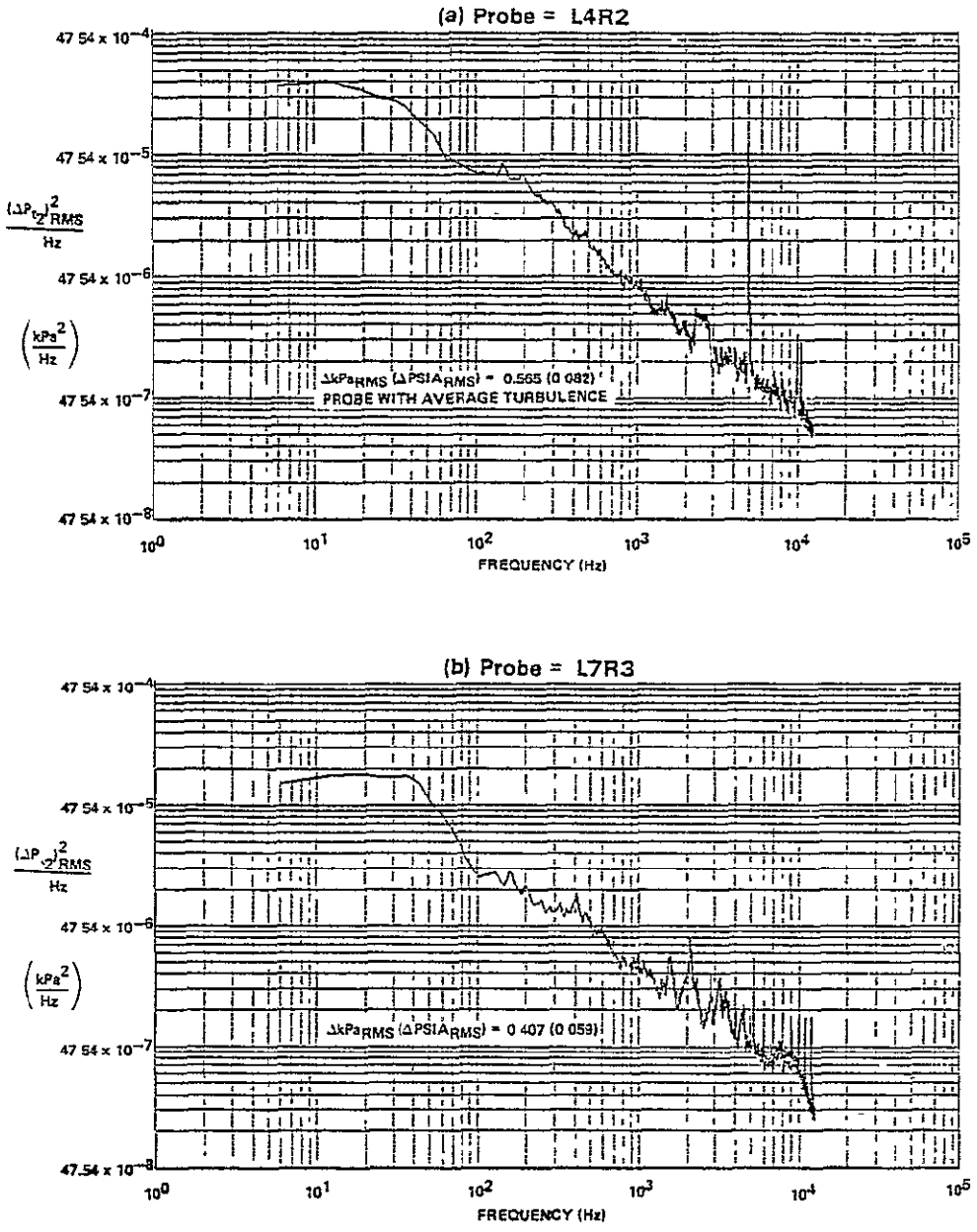


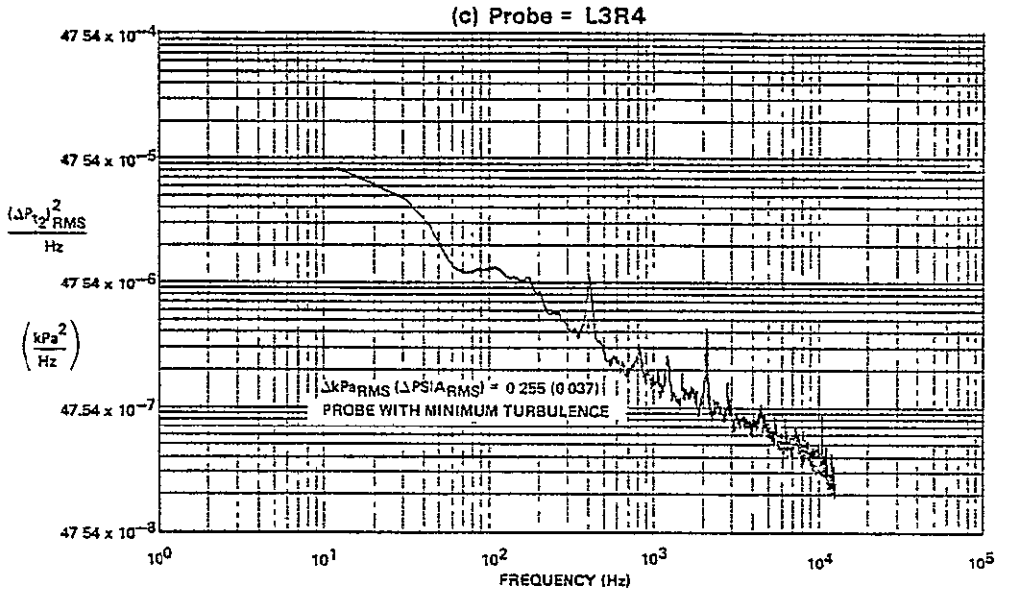
FIGURE D-23
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 2.2, α = −2, β = 0, WAT2 = 62.9%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 249/9 IDENT 61 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 06 21 10.000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	25 0	0774 (120 0)	62 9%	—25 0

1 PSIA = 6.8948 kPa



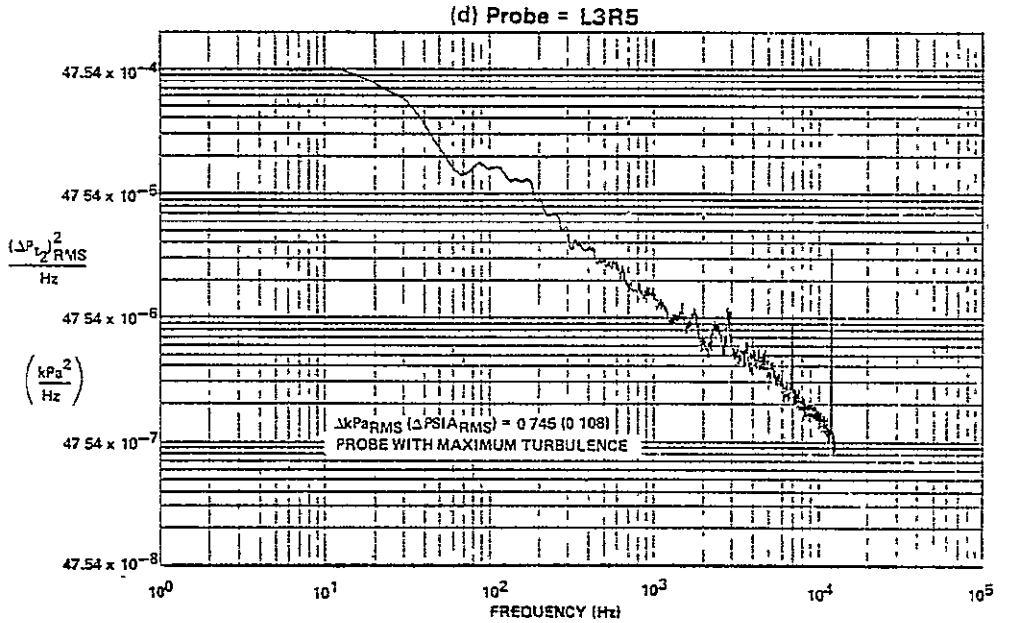
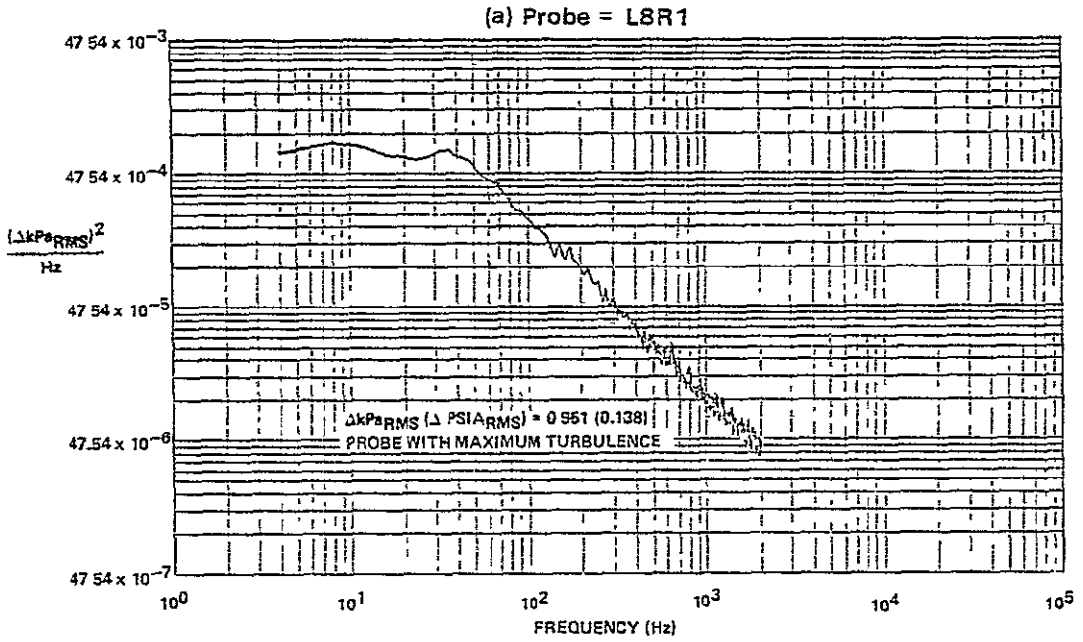


FIGURE D-23 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 62.9%

DATA PART/POINT 385/5 IDENT 62 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 32 35 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	−2	0	−4 0	25 0	0774 (120 0)	61 7%	−25 0

1 PSIA = 6 8948 kPa



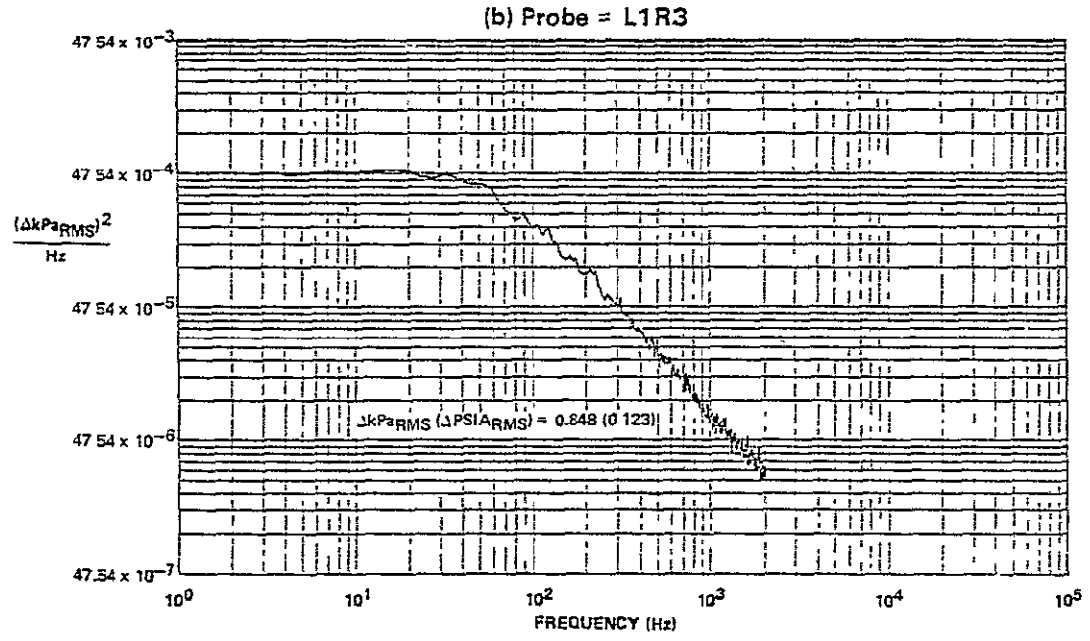


FIGURE D-24
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 61.7%

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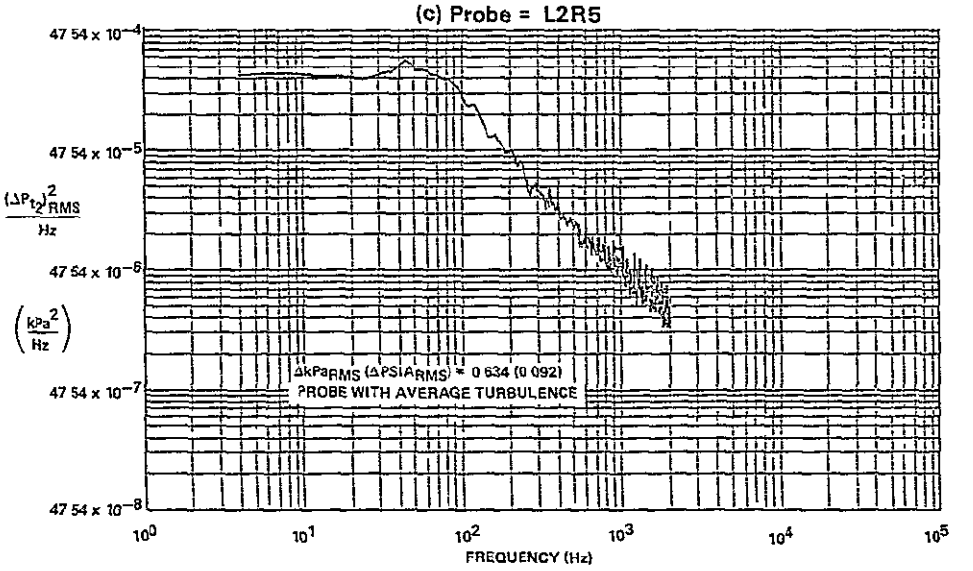
FSCP - NASA DATA STUDY

DATA PART/POINT 385/5 IDENT 62 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 32 35 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	−2	0	−4 0	25 0	0774 (120 0)	61 7%	−25 0

1 PSIA = 6 8948 kPa



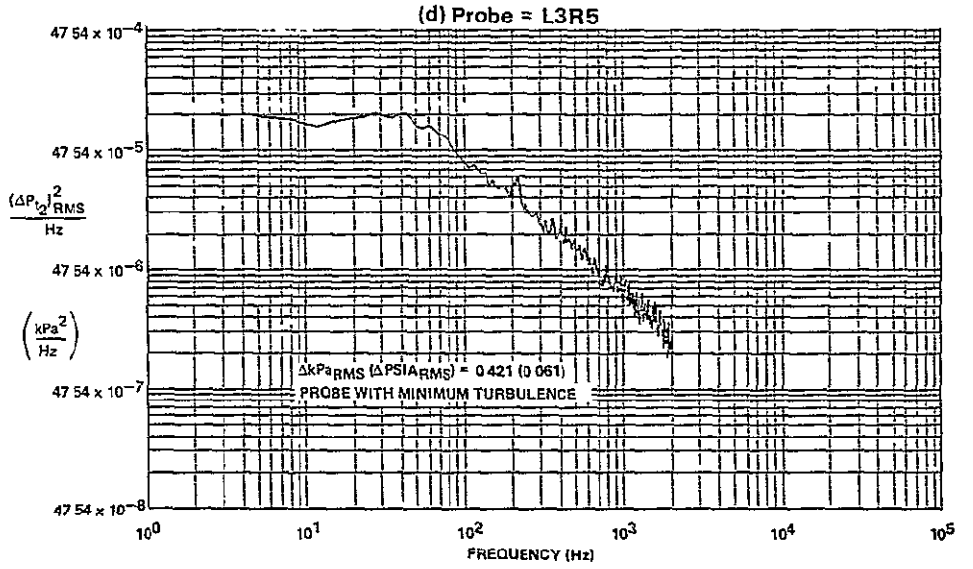


FIGURE D-24 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = −2, β = 0, WAT2 = 61.7%

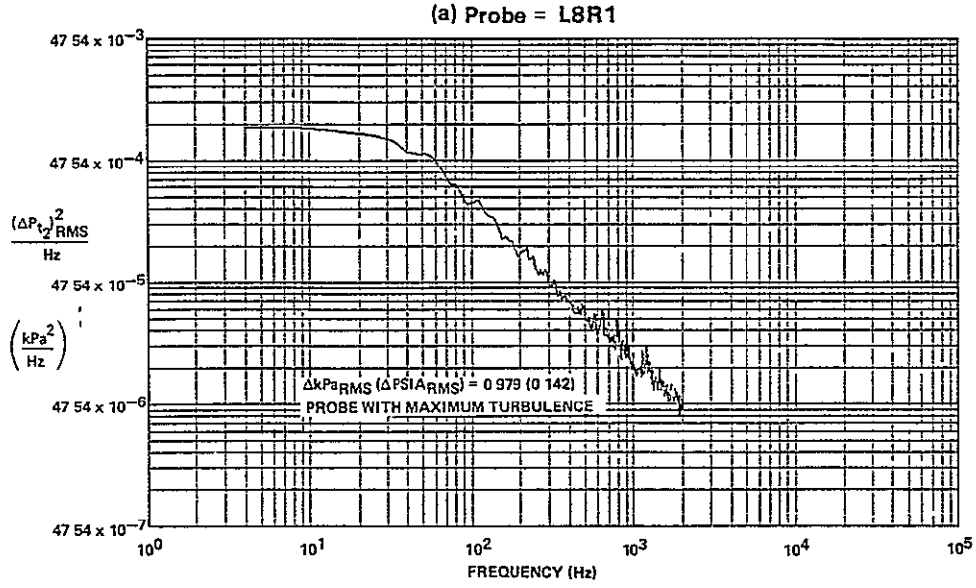
FSCP - NASA DATA STUDY

DATA PART/POINT 385/2 IDENT 63 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 29 15 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	25 0	0775 (120 1)	62 3%	—25 0

1 PSIA = 6 8948 kPa

(a) Probe = L8R1



(b) Probe = L1R3

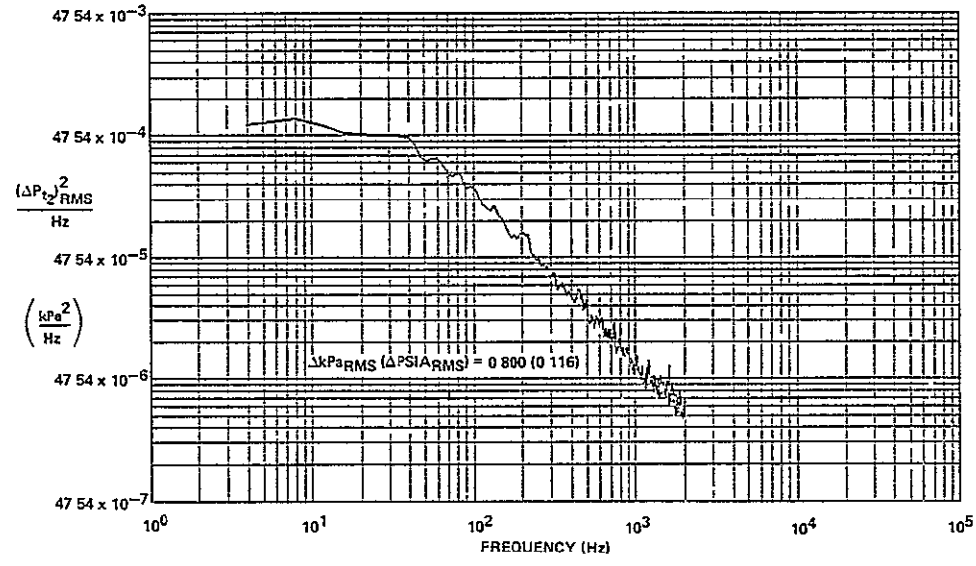
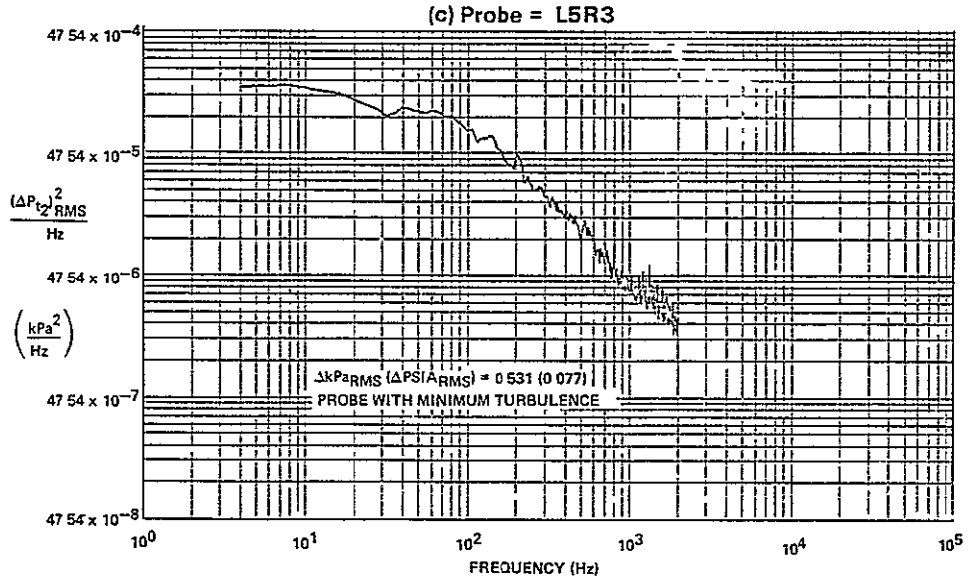


FIGURE D-25
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 62.3%

DATA PART/POINT 385/2 IDENT 63 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 29 15 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	25 0	0775 (120 1)	62 3%	—25 0

1 PSIA = 6 8948 kPa



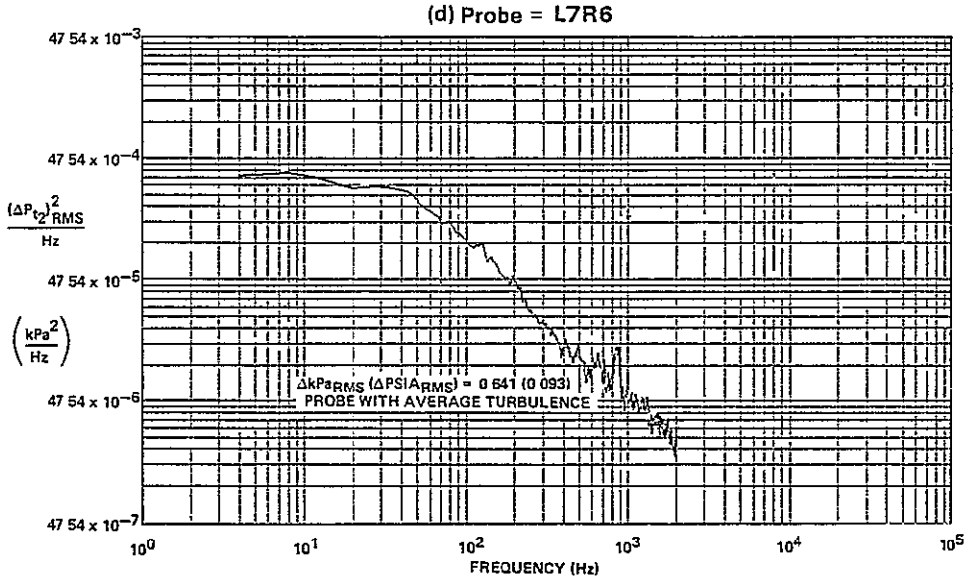


FIGURE D-25 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = —2, β = 0, WAT2 = 62.3%

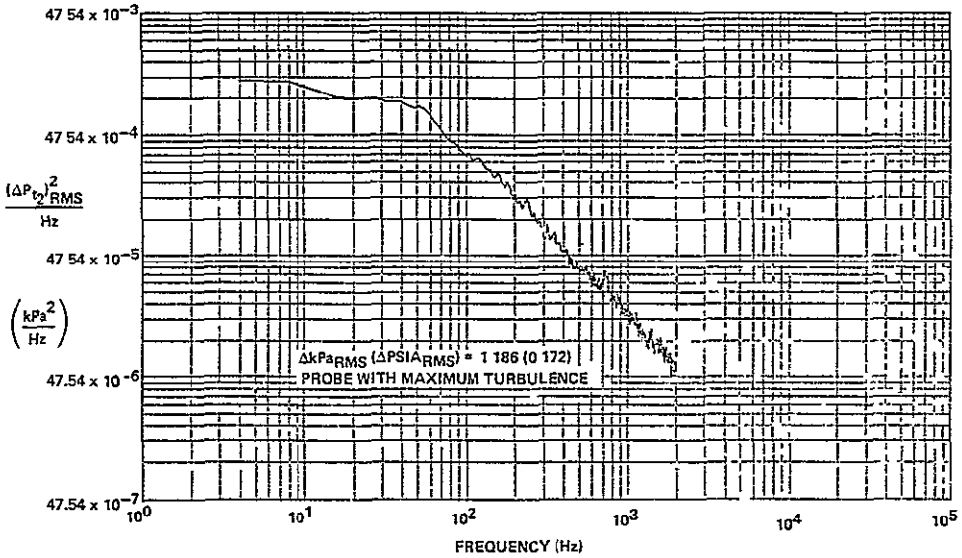
FSE - NASA DATA STUDY

DATA PART/POINT 542/2 IDENT 64 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 22 51 48 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	24 8	0278 (43 1)	60 2%	—25 0

1 PSIA = 6 8948 kPa

(a) Probe = L8R1



(b) Probe = L2R2

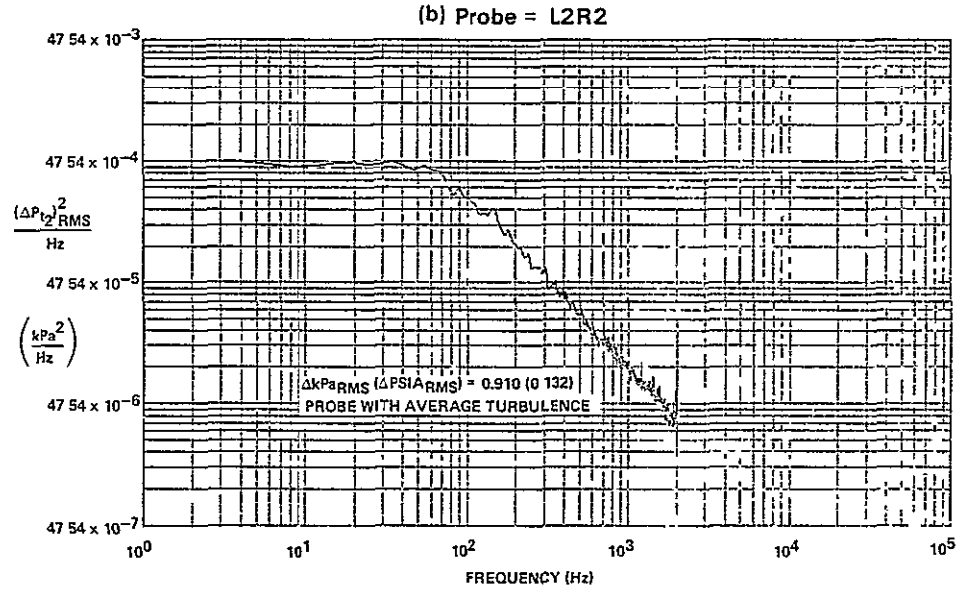


FIGURE D-26
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 2.2, α = —2, β = 0, WAT2 = 60.2%

FSE - NASA DATA STUDY

DATA PART/POINT 542/2 IDENT 64 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 22 51 48 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	−2	0	−4 0	24 8	0278 (43 1)	60 2%	−25 0

1 PSIA = 6 8948 kPa

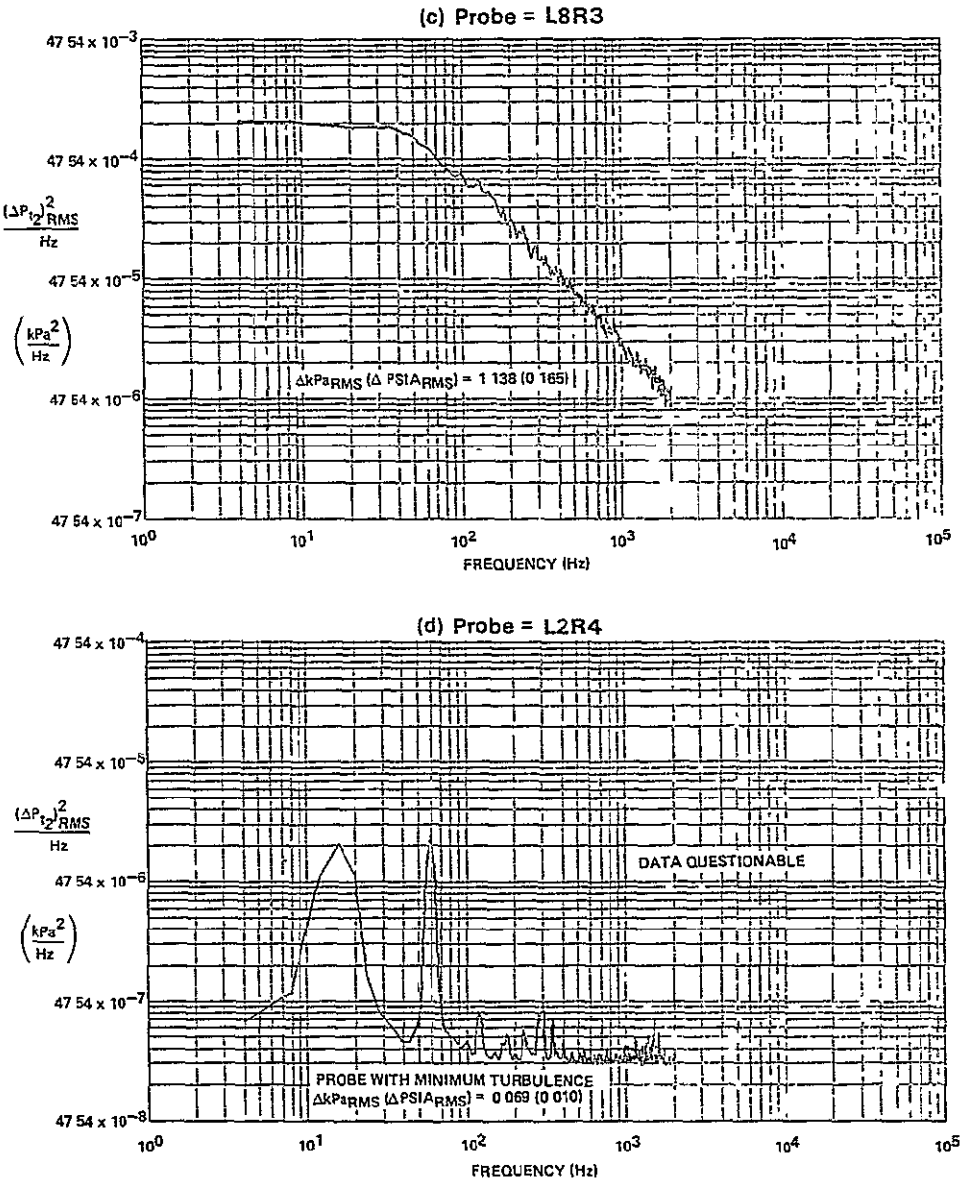


FIGURE D-26 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = −2, β = 0, WAT2 = 60.2%

FSE - NASA DATA STUDY

DATA PART/POINT 543/4 IDENT 65 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 23 12 07 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	24 8	0223 (34 5)	60 5%	—25 0

1 PSIA = 6 8948 kPa

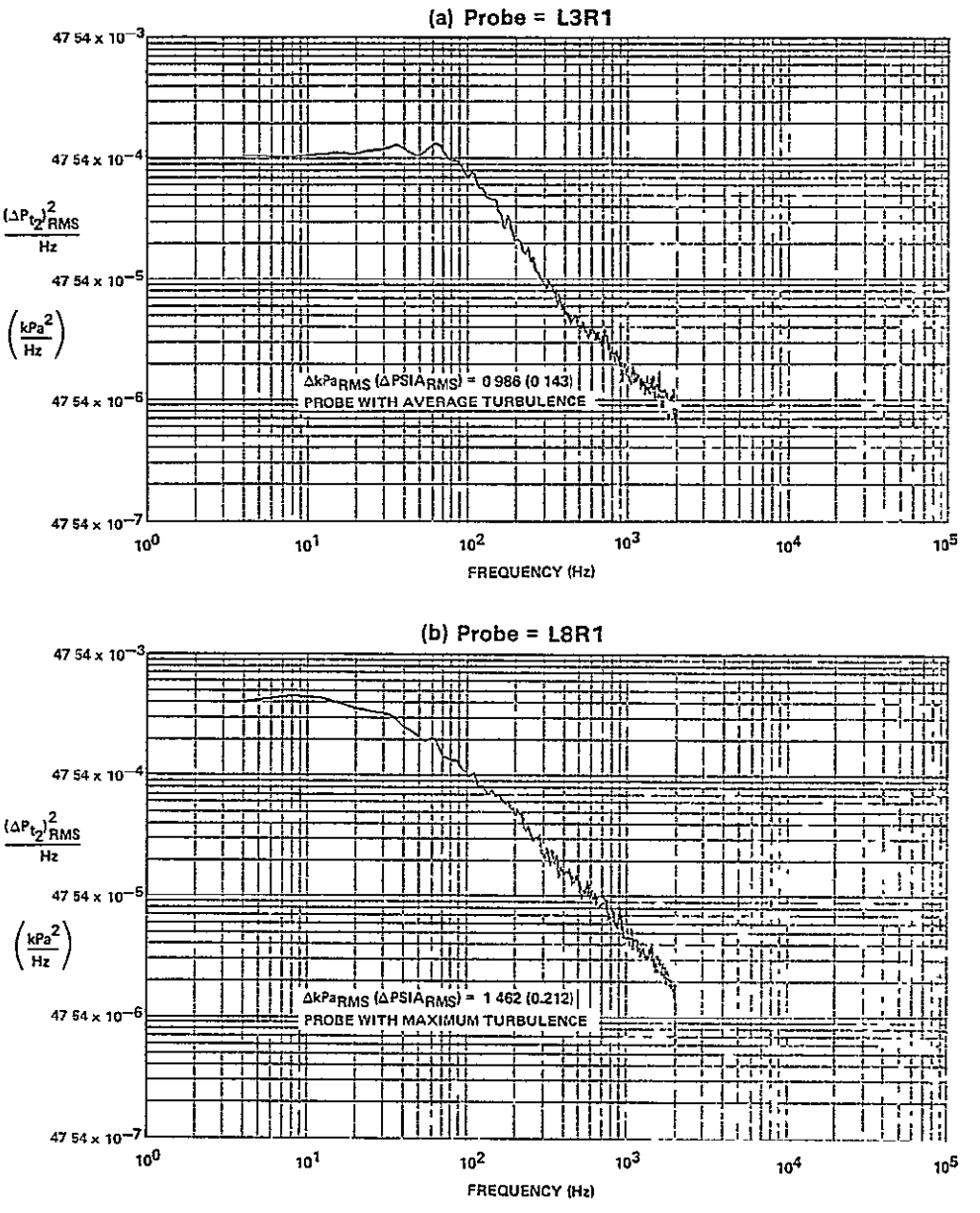


FIGURE D-27
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = -2$, $\beta = 0$, WAT2 = 60.5%

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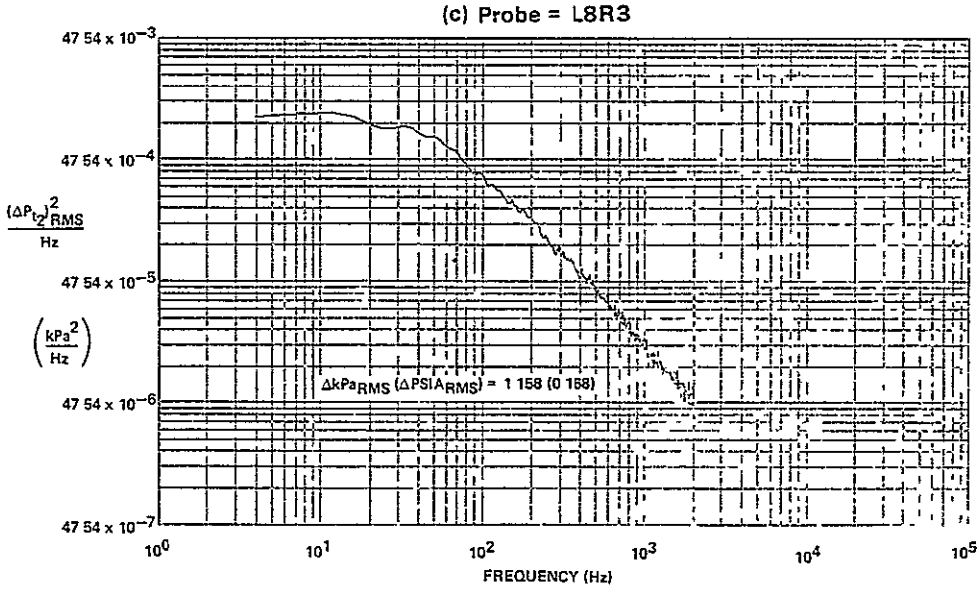
FSE - NASA DATA STUDY 4

DATA PART/POINT 543/4 IDENT 65 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 23 12 07 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	—2	0	—4 0	24 8	0223 (34 5)	60 5%	—25 0

1 PSIA = 6 8948 kPa

(c) Probe = L8R3



(d) Probe = L2R4

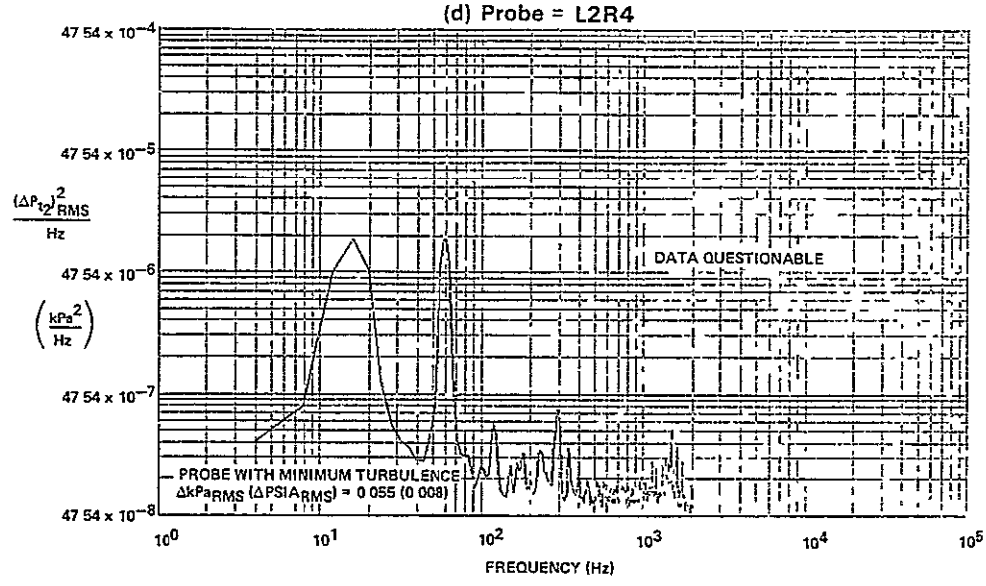


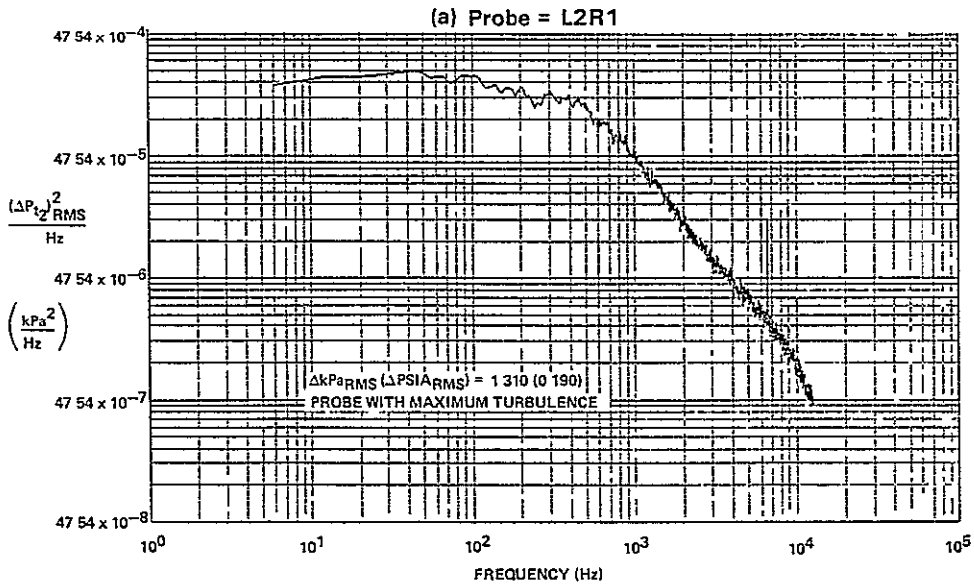
FIGURE D-27 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = —2, β = 0, WAT2 = 60.5%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 184/7 IDENT 66 FREQUENCY RANGE = 4-12000 Hz
THE SEGMENT START TIME WAS AT 20 22 12 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	69 3%	− 25 0

1 PSIA = 6 8948 kPa



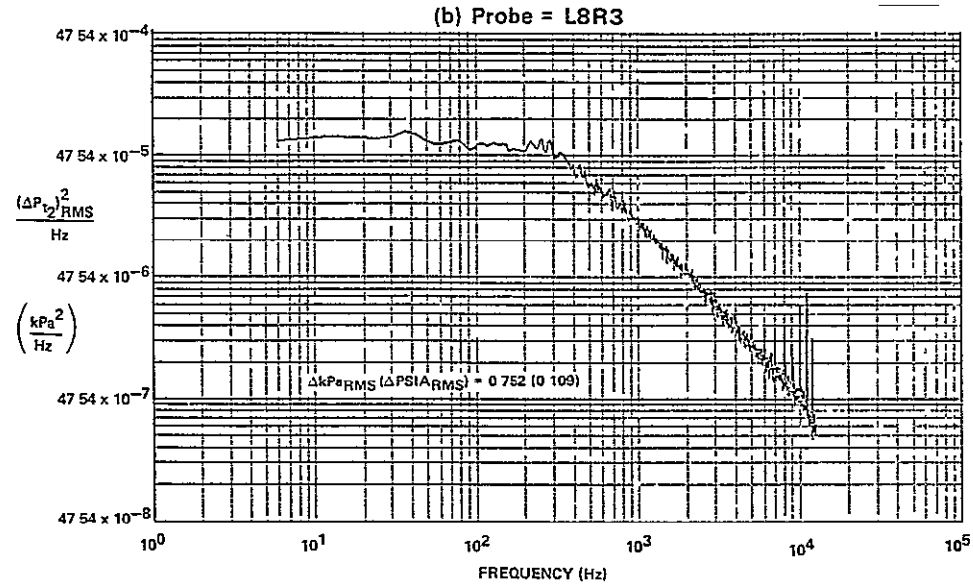


FIGURE D-28
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = 0$, $\beta = 0$, WAT2 = 69.3%

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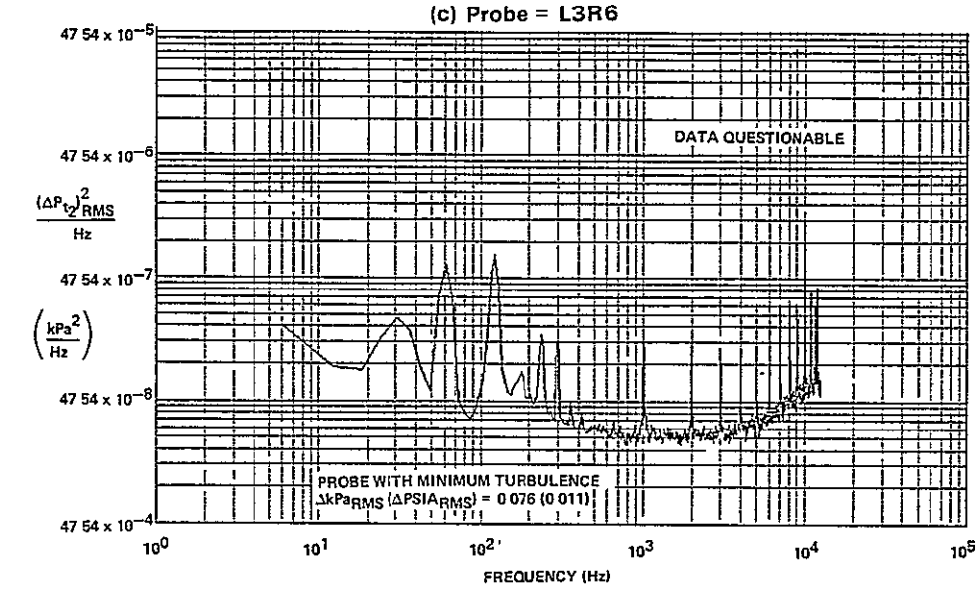
SERIES VIII - NASA DATA STUDY

DATA PART/POINT 184/7 IDENT 66 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 22 12 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	69 3%	−25 0

1 PSIA = 6 8948 kPa



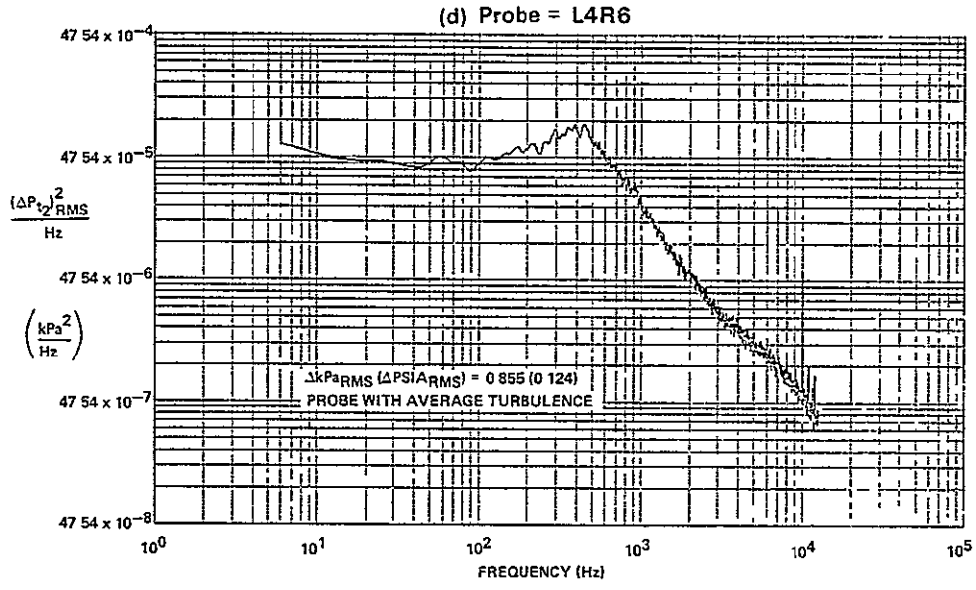


FIGURE D-28 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = 0$, $\beta = 0$, WAT2 = 69 3%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 184/5 IDENT 67 @ FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 19 38 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	75 4%	−25 0

1 PSIA = 6 8948 kPa

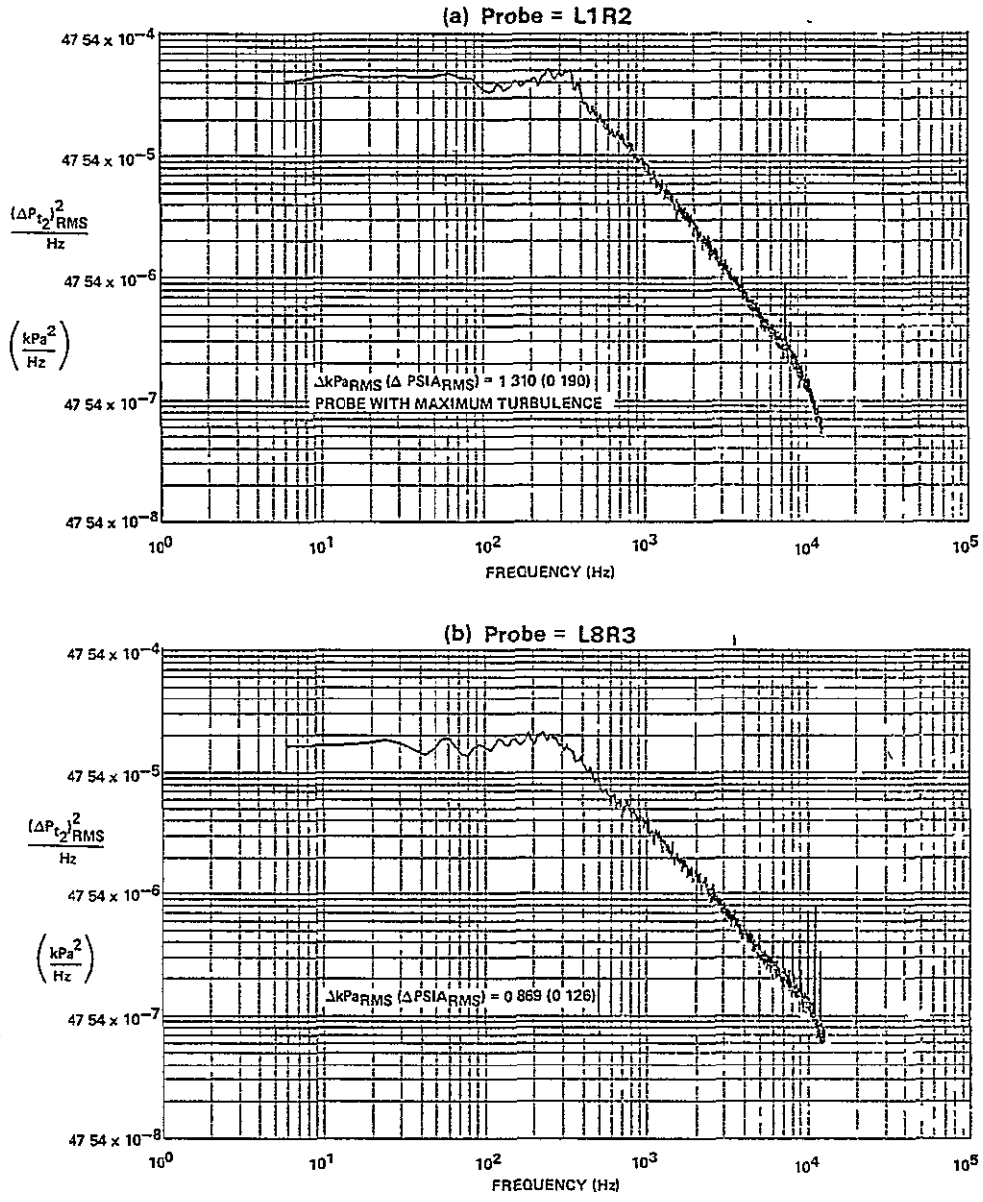
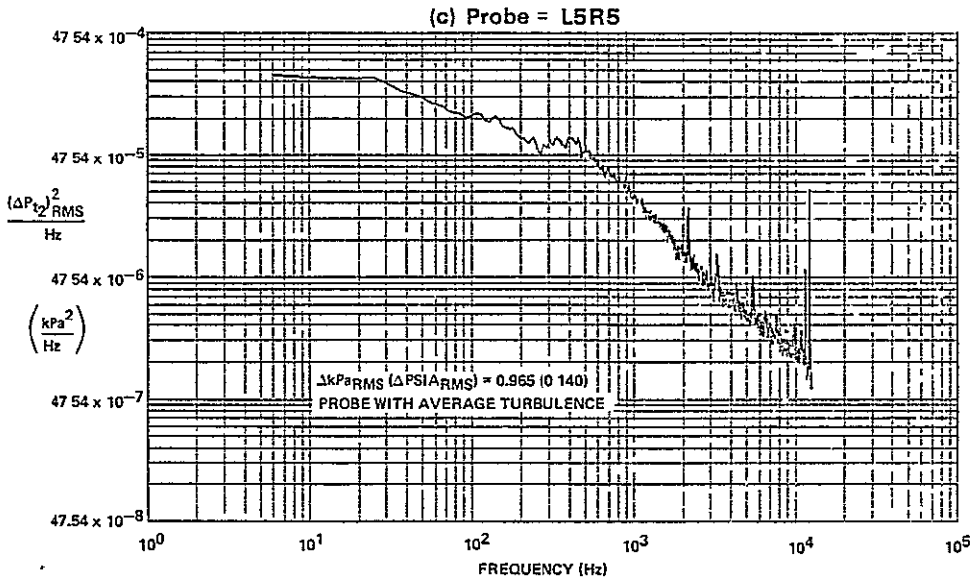


FIGURE D-29
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = 0$, $\beta = 0$, WAT2 = 75.4%

DATA PART/POINT 184/5 IDENT 67 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 19 38 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	75 4%	−25 0

1 PSIA = 6 8948 kPa



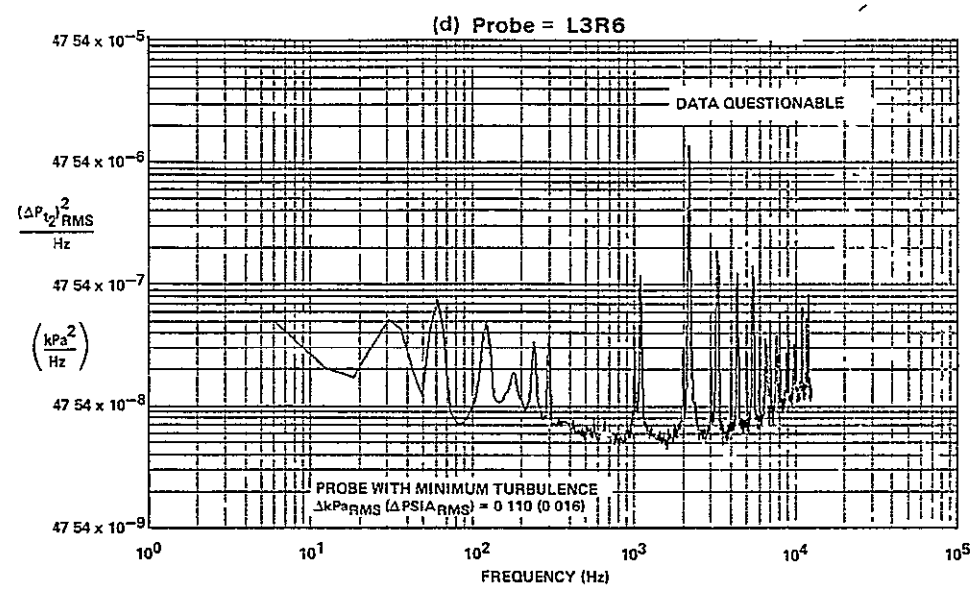


FIGURE D-29 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 0$, $\beta = 0$, WAT2 = 75.4%

FSCP - NASA DATA STUDY

DATA PART/POINT 413/9 IDENT 68 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 22 30 10 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	—2 0	22 5	0 0	73 6%	—25 0

1 PSIA = 6 8948 kPa

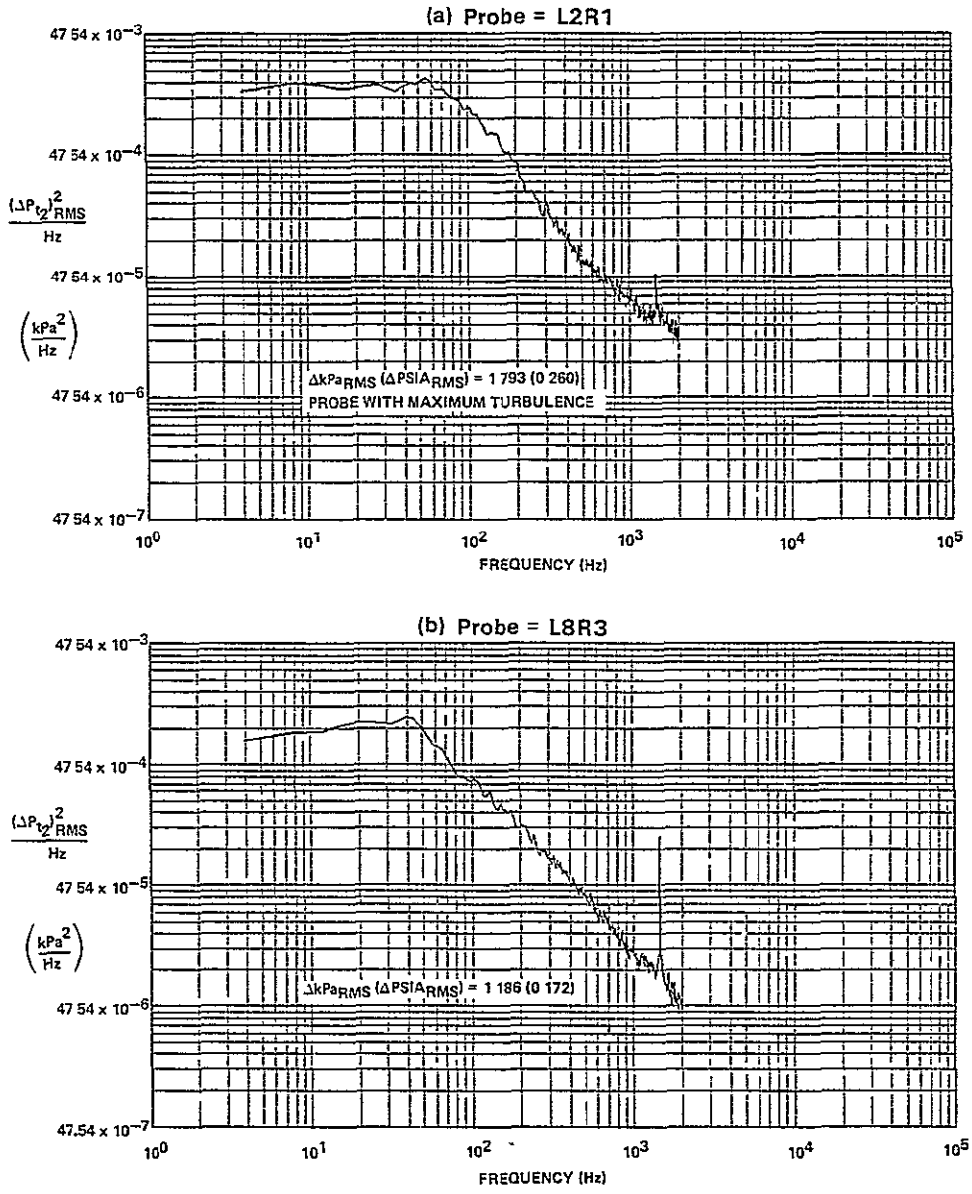


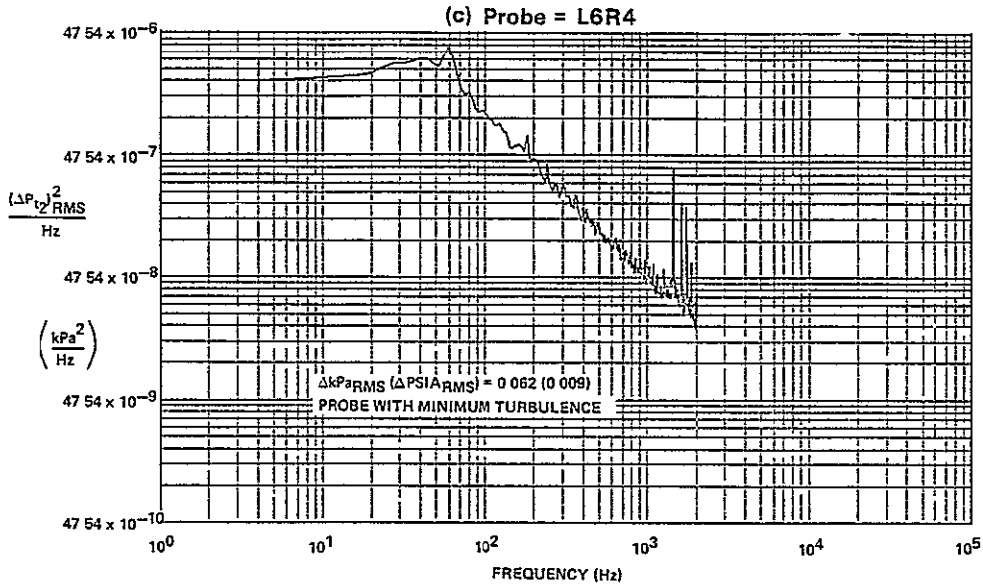
FIGURE D-30
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 0, β = 0, WAT2 = 73.6%

FSCP - NASA DATA STUDY

DATA PART/POINT 413/9 IDENT 68 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 22 30 10 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	73 6%	−25 0

1 PSIA = 6 8948 kPa



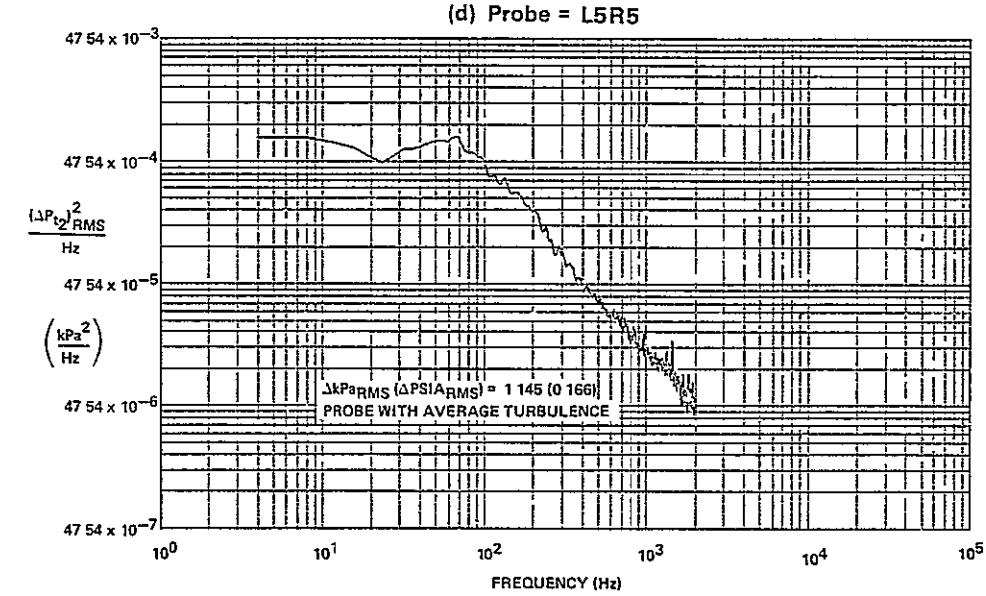


FIGURE D-30 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 0, β = 0, WAT2 = 73.6%

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FSCP - NASA DATA STUDY

DATA PART/POINT 413/12 IDENT 69 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 22 34 15 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	—2 0	22 5	0 0	68 3%	—25 0

1 PSIA = 6 8948 kPa

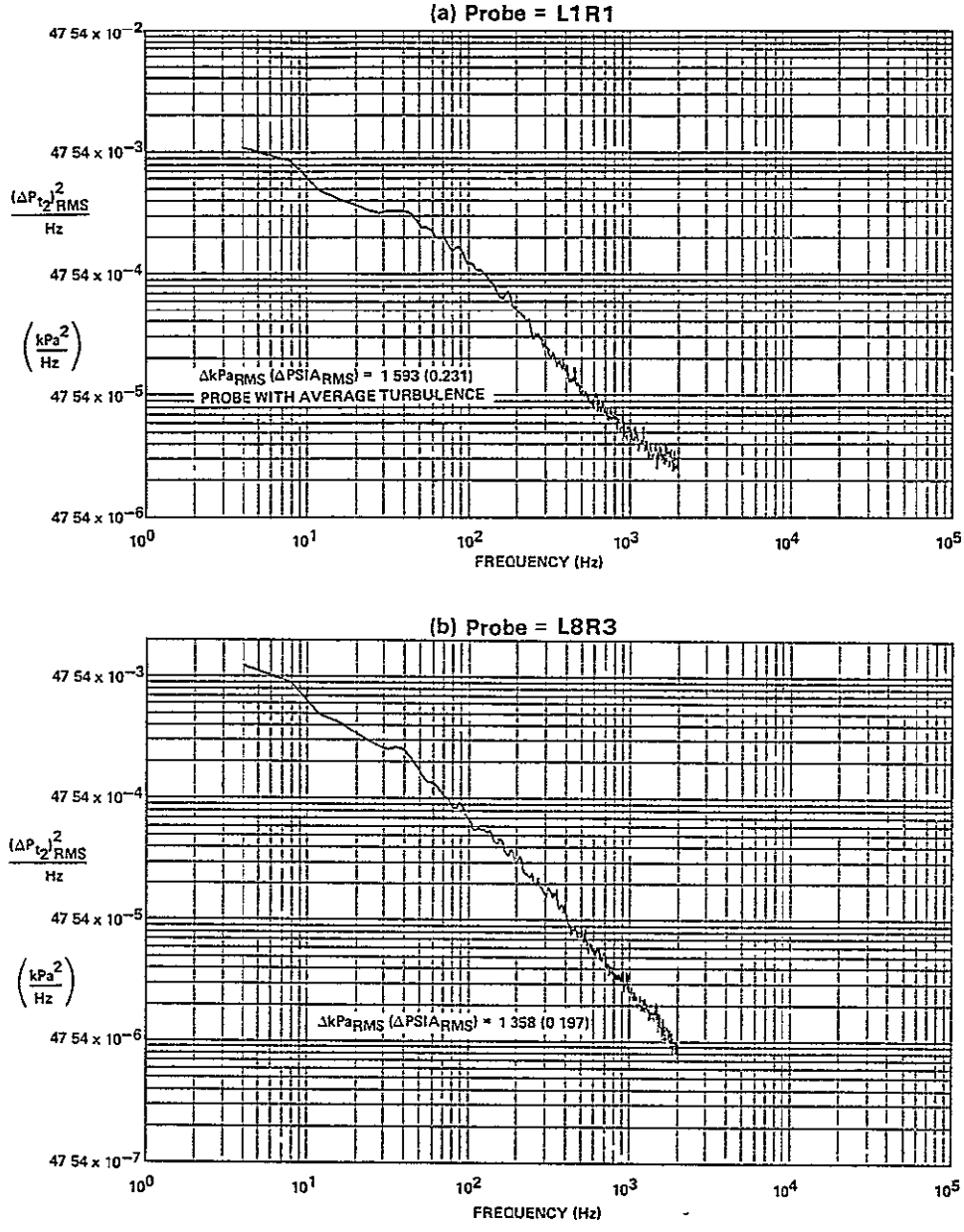


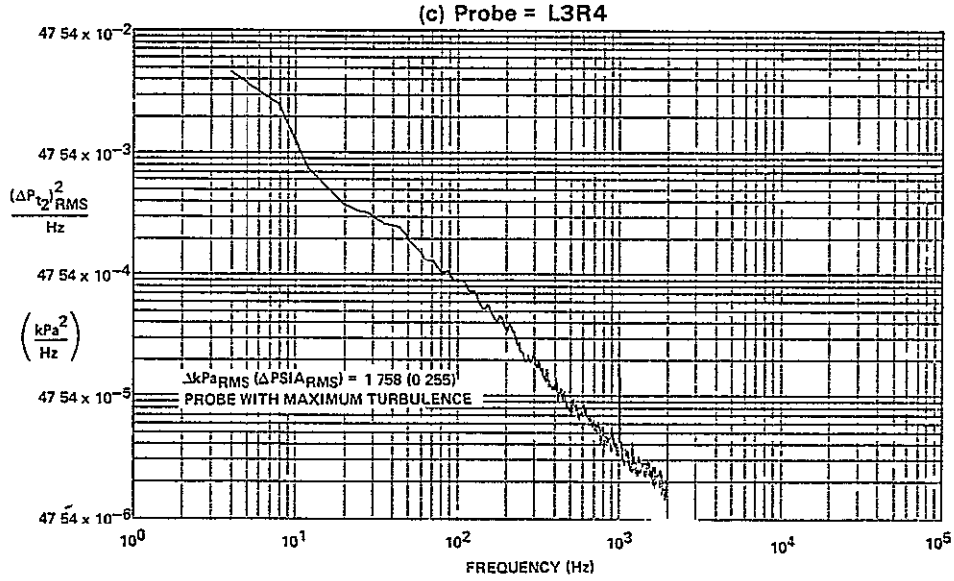
FIGURE D-31
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 0$, $\beta = 0$, WAT2 = 68.3%

DATA PART/POINT 413/12 IDENT 69 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 22 34 15 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	0	0	−2 0	22 5	0 0	68 3%	−25 0

1 PSIA = 6 8948 kPa

(c) Probe = L3R4



(d) Probe = L6R4

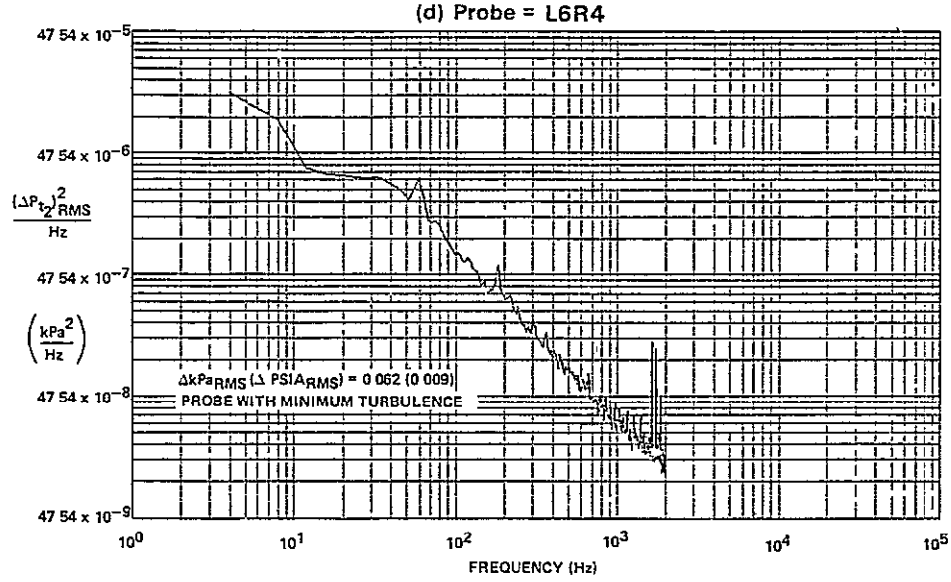


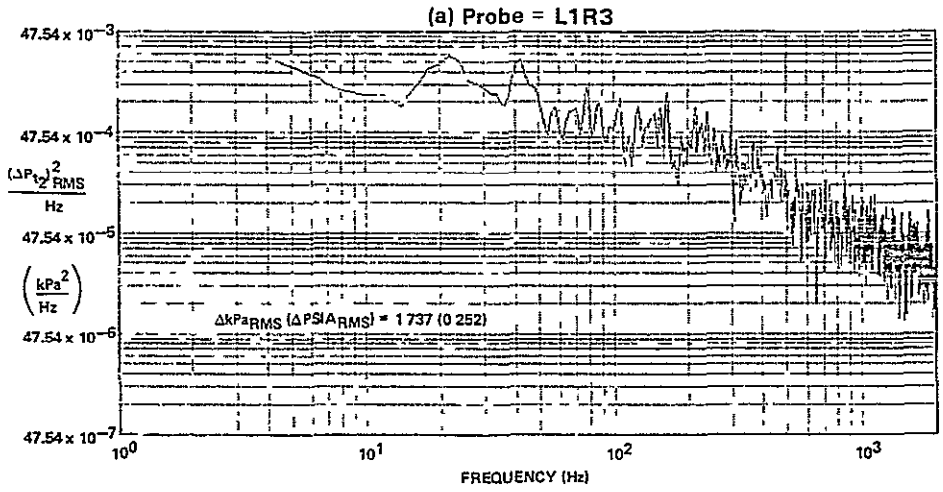
FIGURE D-31 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = 0, β = 0, WAT2 = 68.3%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 425/1 IDENT 70 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 05 09 58 870
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
2 21	0 1	0 2	16523 (54210)	−2 2	22 9	0 0	73 0%	−25 000

1 PSIA = 6 8948 kPa



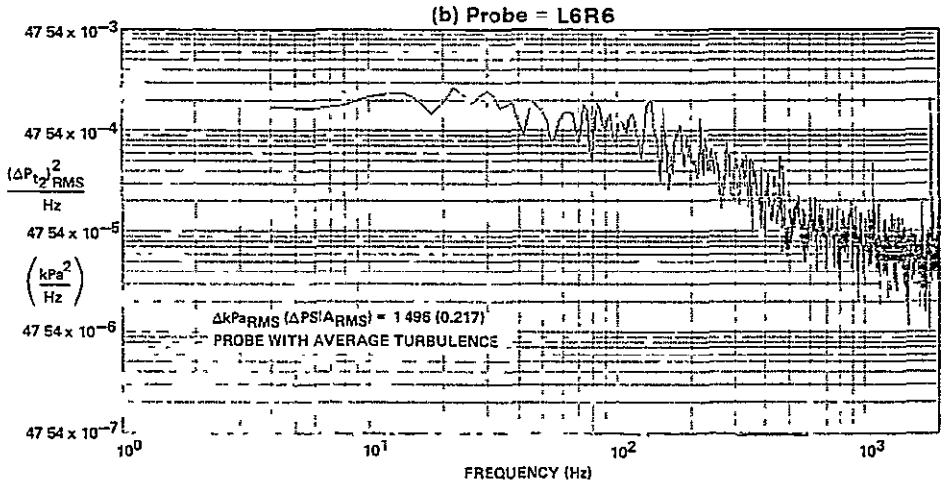


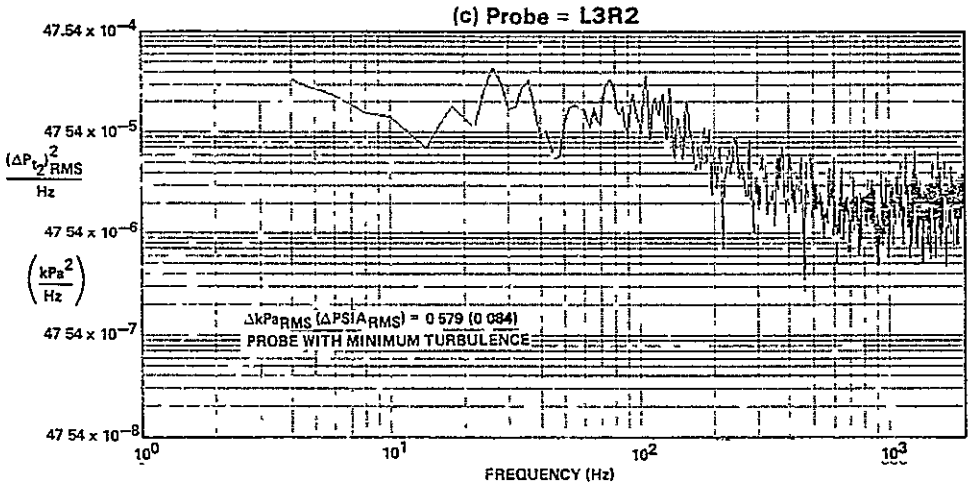
FIGURE D-32
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.21, α = 0.1, β = 0.2, WAT2 = 73.0%

FLIGHT - NASA DATA STUDY

DATA FLIGHT/RUN 425/1 IDENT 70 FREQUENCY RANGE = 4 — 2000 Hz
THE SEGMENT START TIME WAS AT 05 09 58 870
BANDWIDTH = 4 0 Hz RECORD LENGTH = 1 0 SECONDS

MACH	ALPHA	BETA	ALT	RHO	DELTA3	BYPASS	WAT2	CIVV
2 21	0 1	0 2	16523 (54210)	—2 2	22 9	0 0	73 0%	—25 000

1 PSIA = 6 8948 kPa



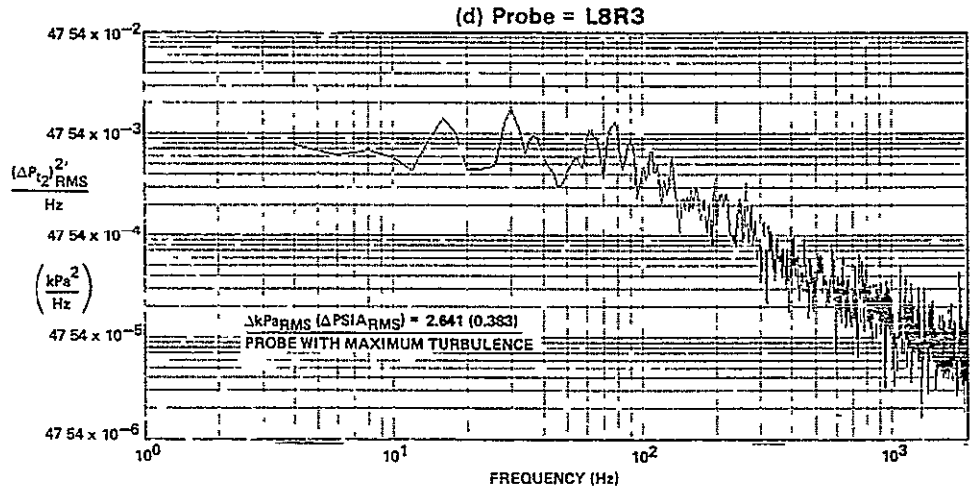


FIGURE D-32 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.21$, $\alpha = 0.1$, $\beta = 0.2$, WAT2 = 73.0%

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FSCP - NASA DATA STUDY

DATA PART/POINT 382/3 IDENT 71 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 52 38 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	0 0	25 0	0774 (120 0)	60 7%	—25 0

1 PSIA = 6 8948 kPa

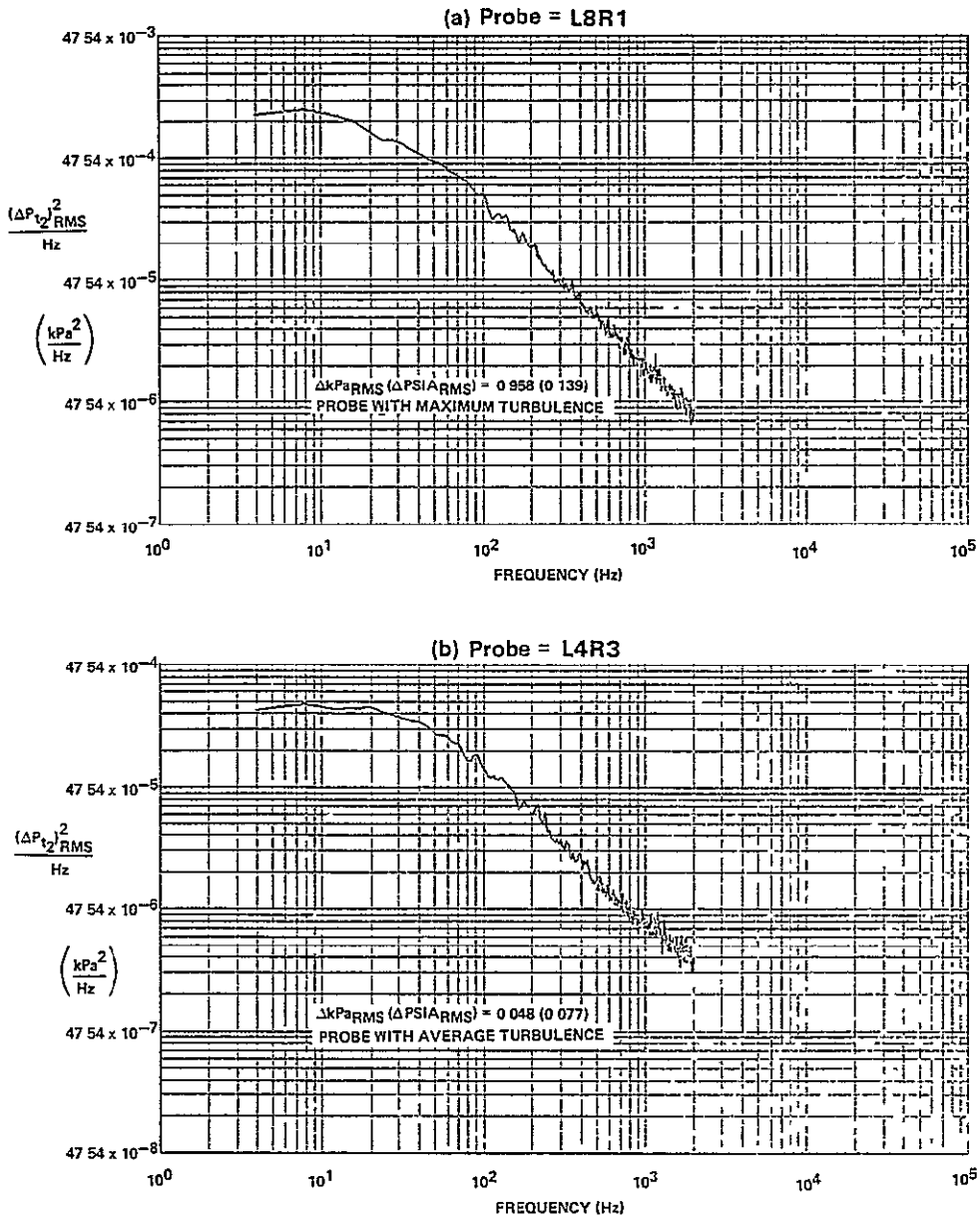


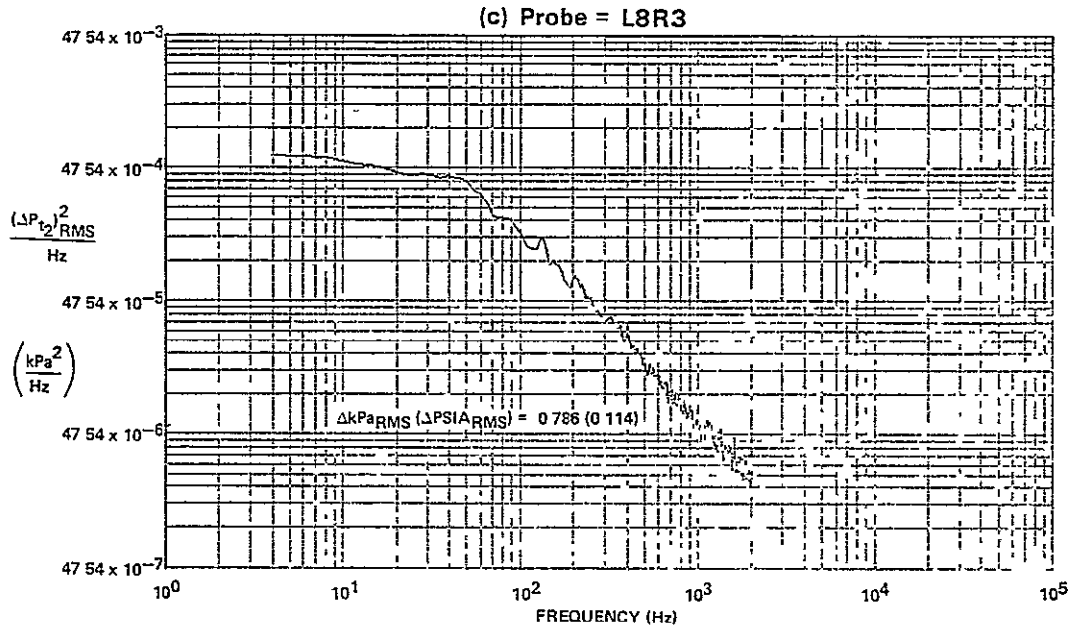
FIGURE D-33
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = 4$, $\beta = 0$, WAT2 = 60.7%

FSCP - NASA DATA STUDY

DATA PART/POINT 382/3 IDENT 71 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 00 52 38 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	0 0	25 0	0774 (120 0)	60 7%	−25 0

1 PSIA = 6 8948 kPa



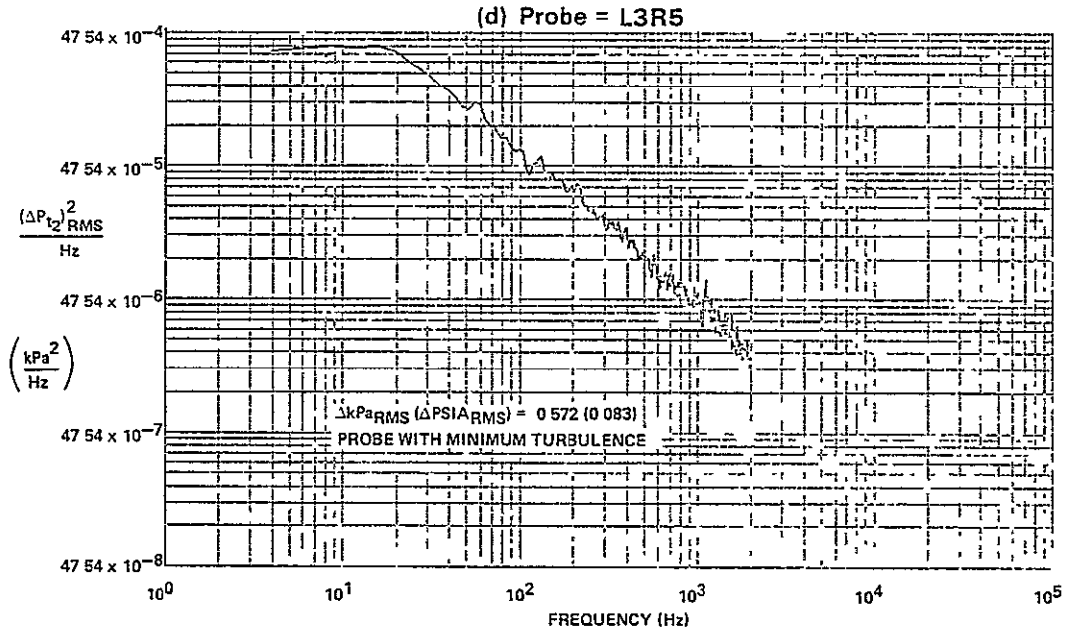
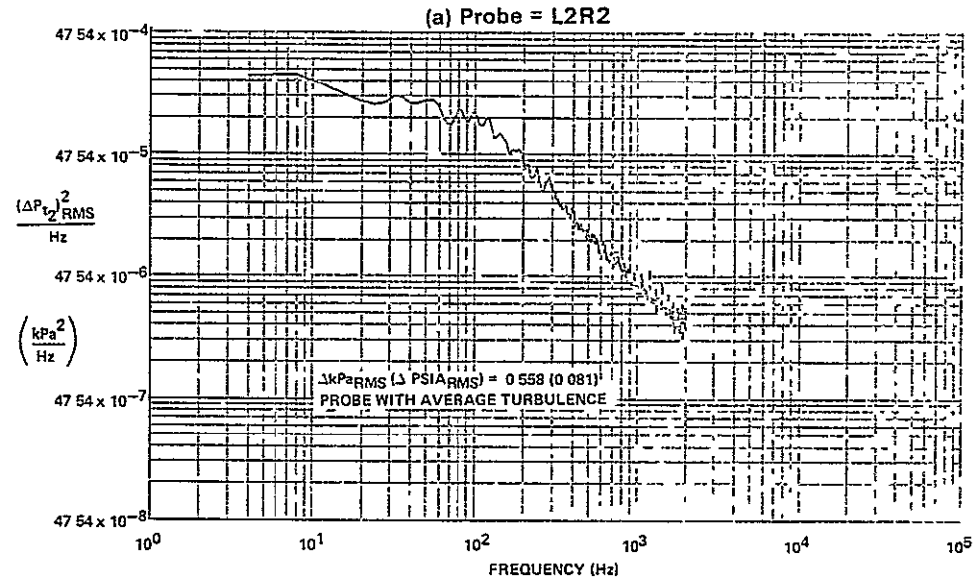


FIGURE D-33 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 4, β = 0, WAT2 = 60.7%

DATA PA°T/POINT 545/2 IDENT 72 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 23 30 02 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	1 0	25 0	0781 (121 1)	59 2%	−25 0

1 PSIA = 6 8948 kPa



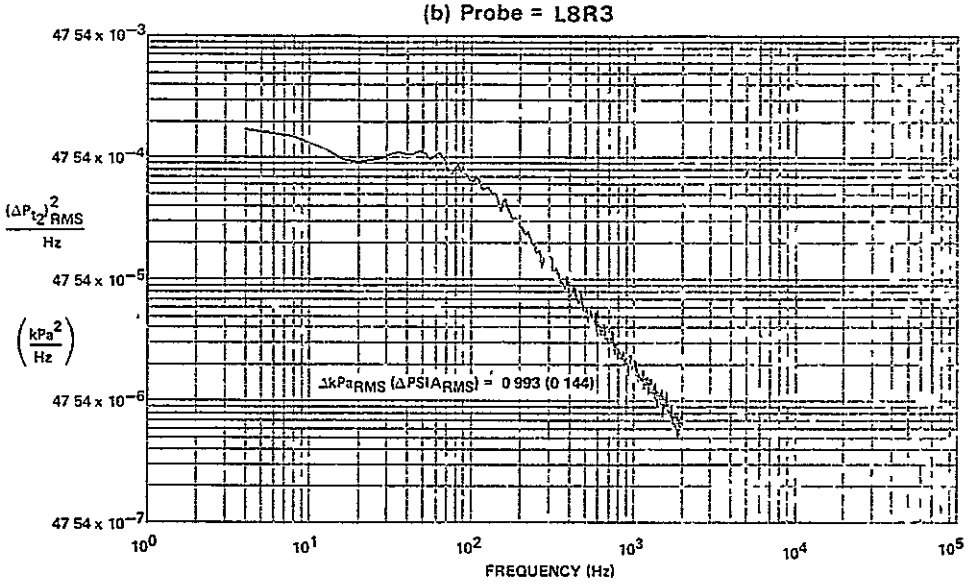


FIGURE D-34
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 4$, $\beta = 0$, WAT2 = 59.2%

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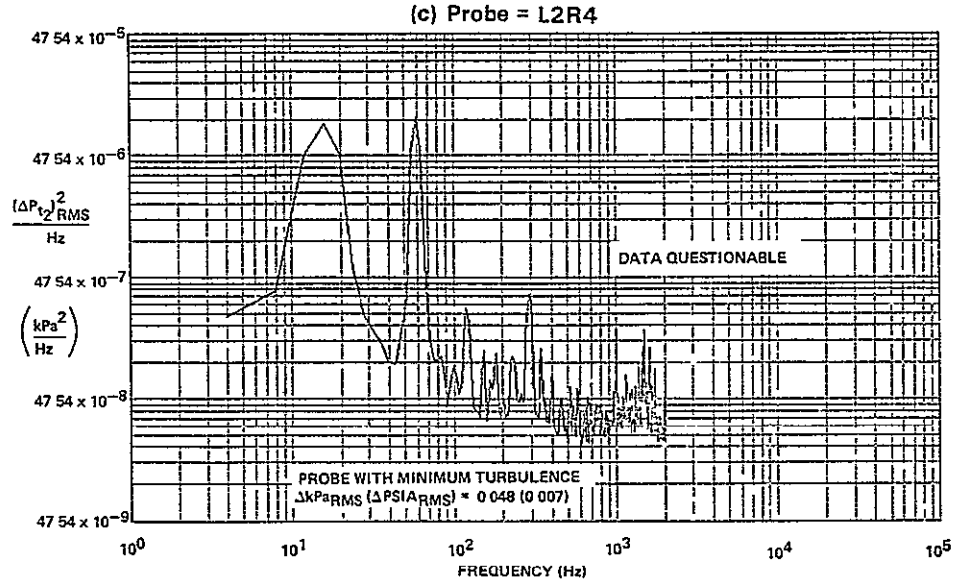
FSE - NASA DATA STUDY

DATA PART/POINT 545/2 IDENT 72 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 23 30 02 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	1 0	25 0	0781 (121 1)	59 2%	—25 0

1 PSIA = 6 8948 kPa



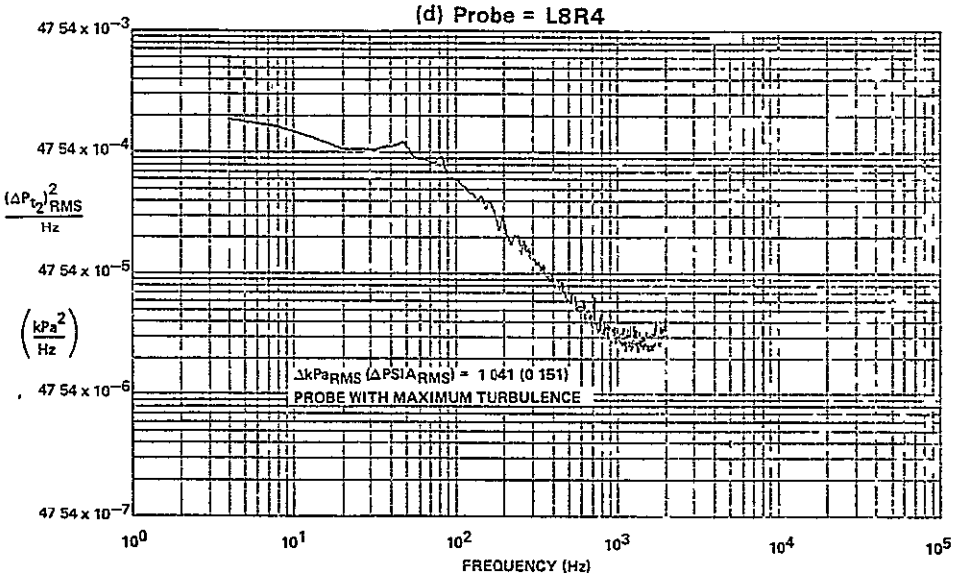


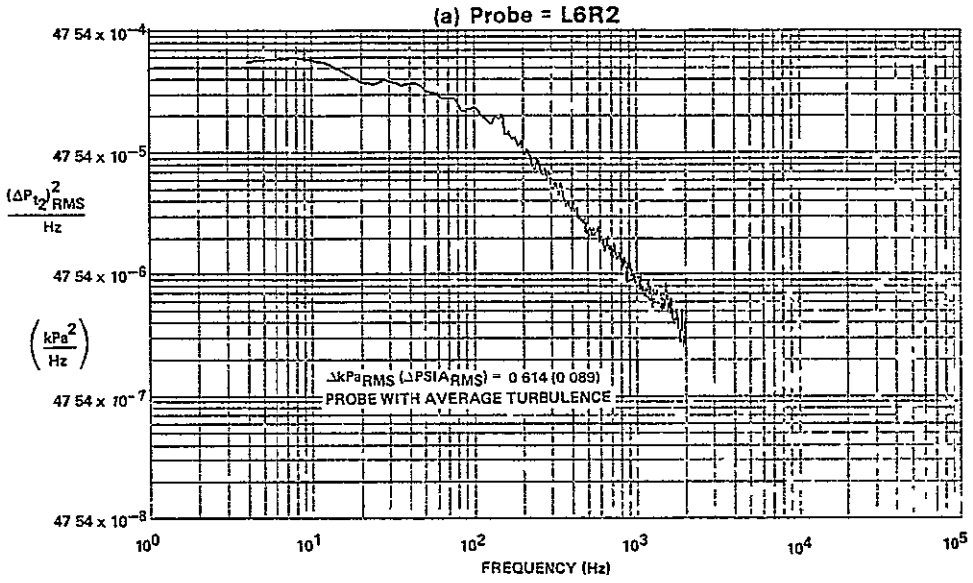
FIGURE D-34 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = 4, β = 0, WAT2 = 59.2%

FSE - NASA DATA STUDY

DATA PART/POINT 546/4 IDENT 73 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 23 43 50 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	1 0	25 0	0781 (121 1)	58 2%	−25 0

1 PSIA = 6 8948 kPa



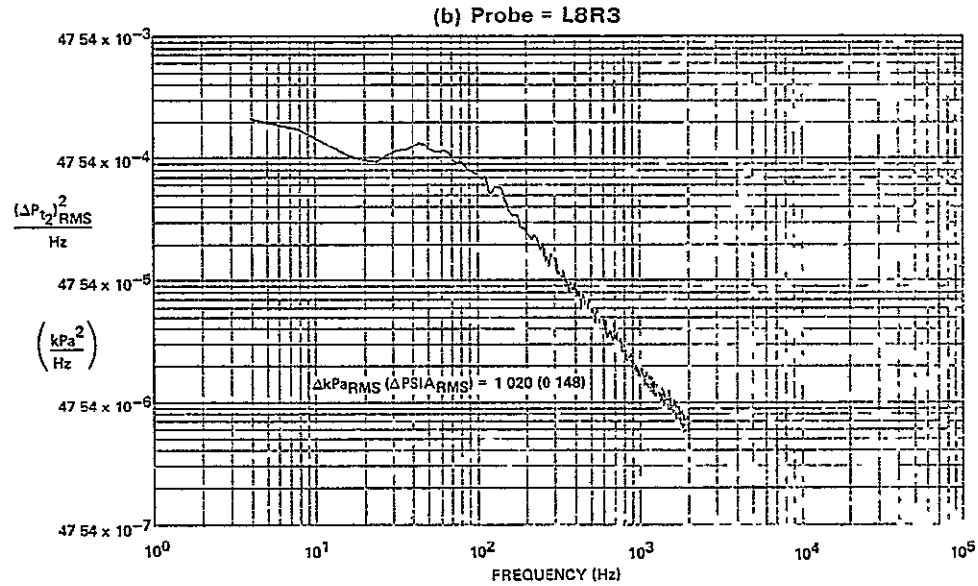


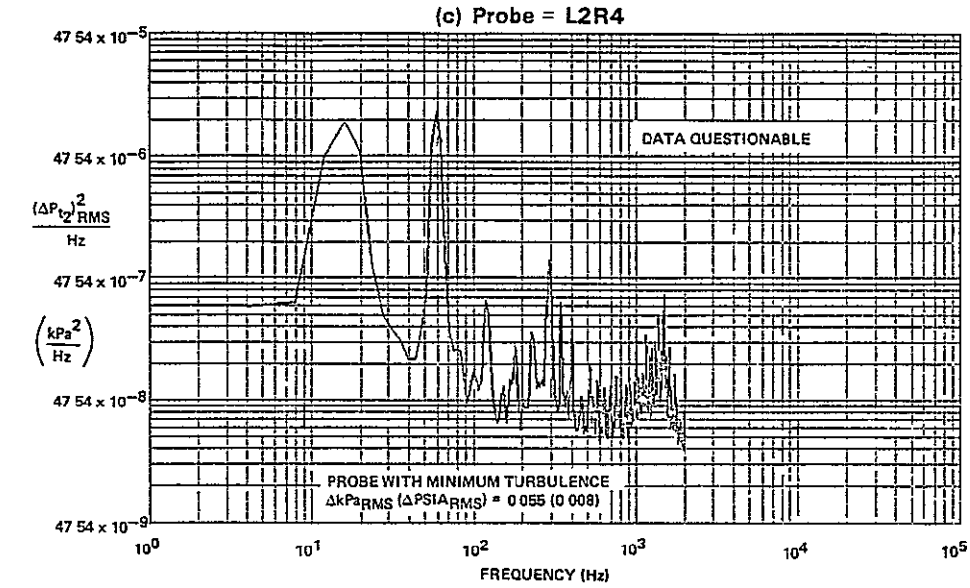
FIGURE D-35
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 4, β = 0, WAT2 = 58.2%

FSE - NASA DATA STUDY

DATA PART/POINT 546/4 IDENT 73 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 23 43 50 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	4	0	1 0	25 0	0781 (121 1)	58 2%	—25 0

1 PSIA = 6 8948 kPa



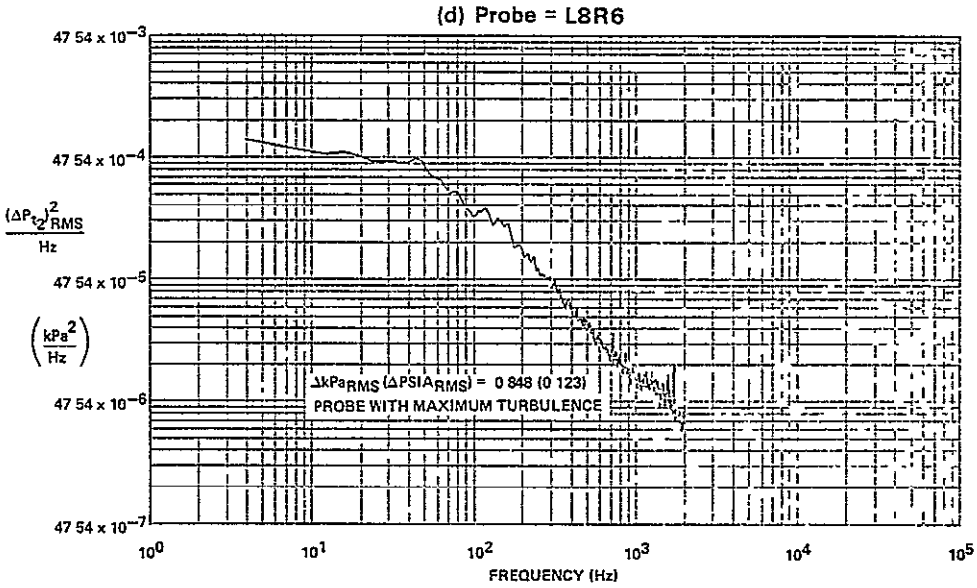


FIGURE D-35 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 4$, $\beta = 0$, WAT2 = 58.2%

FSCP - NASA DATA STUDY

DATA PART/POINT 384/2 IDENT 76 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 01 21 54 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	12	0	6 8	25 0	0774 (120 0)	60 8%	—25 0

1 PSIA = 6 8948 kPa

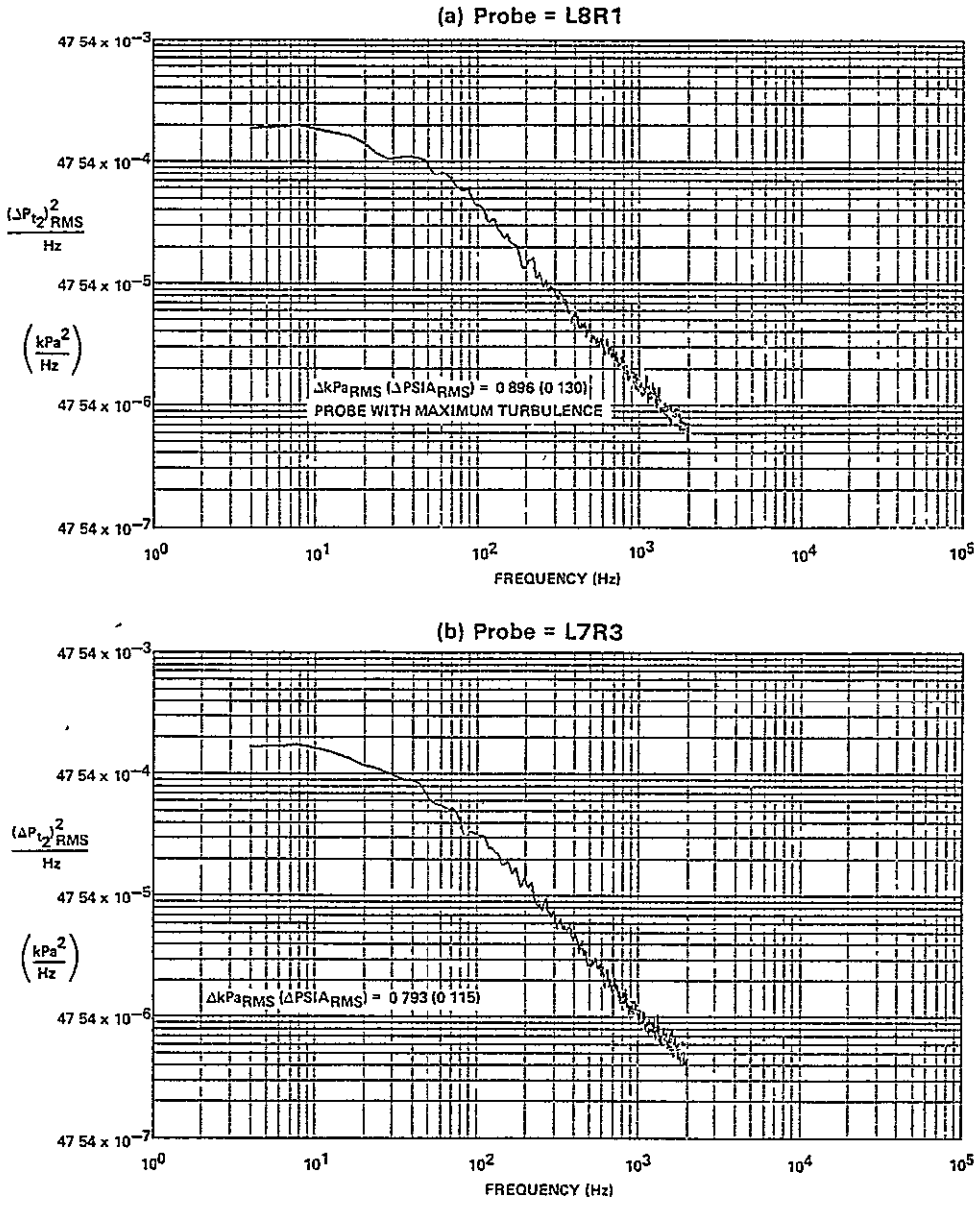
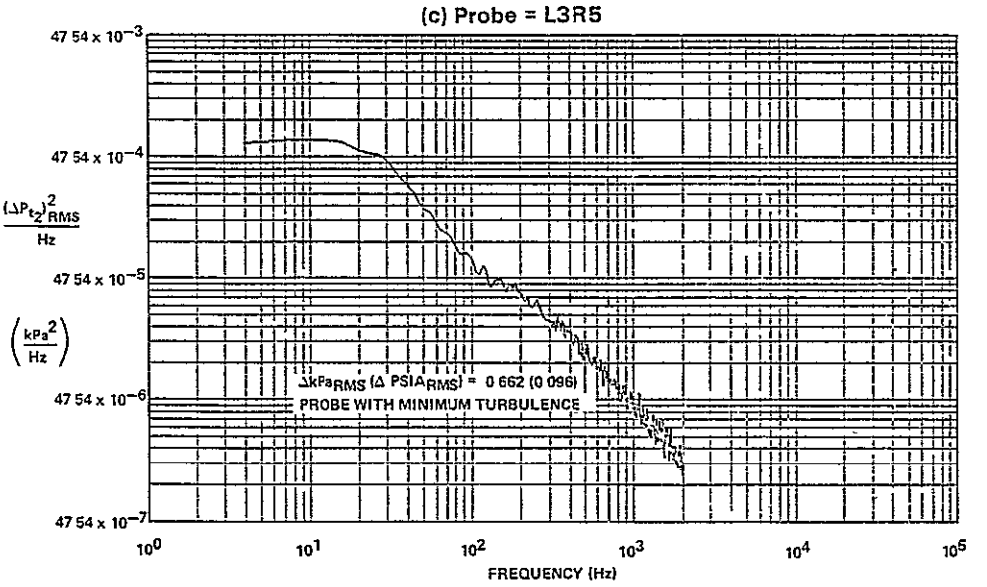


FIGURE D-36
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.2$, $\alpha = 12$, $\beta = 0$, WAT2 = 60.8%

DATA PART/POINT 384/2 IDENT 76 FREQUENCY RANGE = 4 — 2024 Hz
THE SEGMENT START TIME WAS AT 01 21 54 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	12	0	6 8	25 0	0774 (120 0)	60 8%	−25 0

1 PSIA = 6 8948 kPa



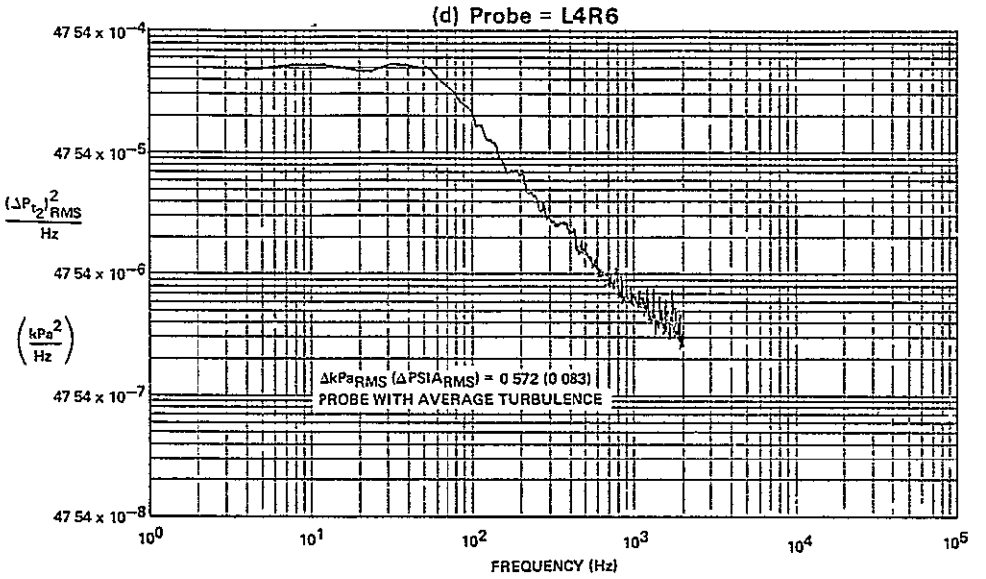


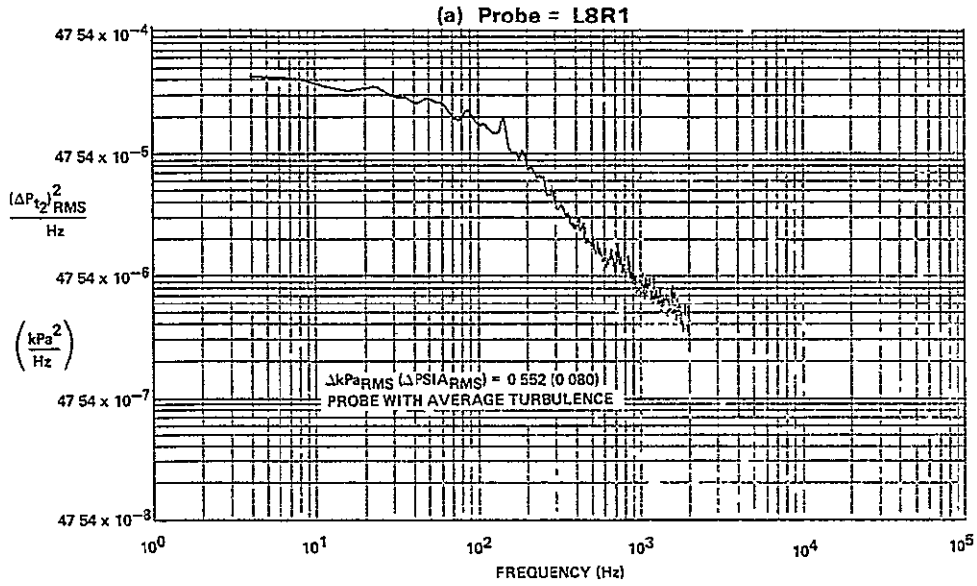
FIGURE D-36 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 12, β = 0, WAT2 = 60.8%

FSE - NASA DATA STUDY

DATA PART/POINT 548/3 IDENT 77 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 00 19 28 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	11	0	6 8	24 8	0774 (120 0)	59 0%	−25 0

1 PSIA = 6 8948 kPa



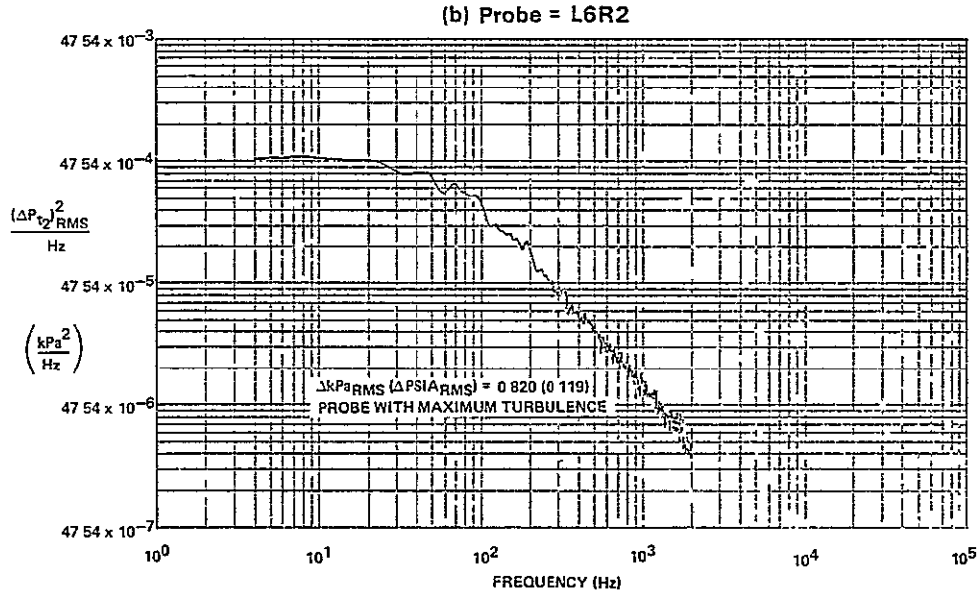


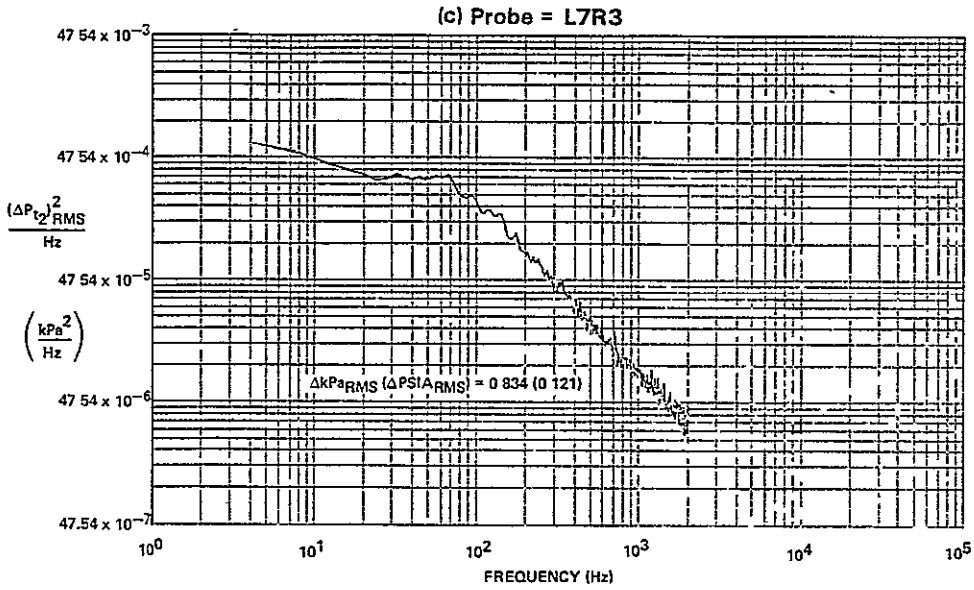
FIGURE D-37
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 11$, $\beta = 0$, WAT2 = 59.0%

'FSE - NASA DATA STUDY

DATA PART/POINT 548/3 IDENT 77 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 00 19 28 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	11	0	6 8	24 8	0774 (120 0)	59 0%	—25 0

1 PSIA = 6 8948 kPa



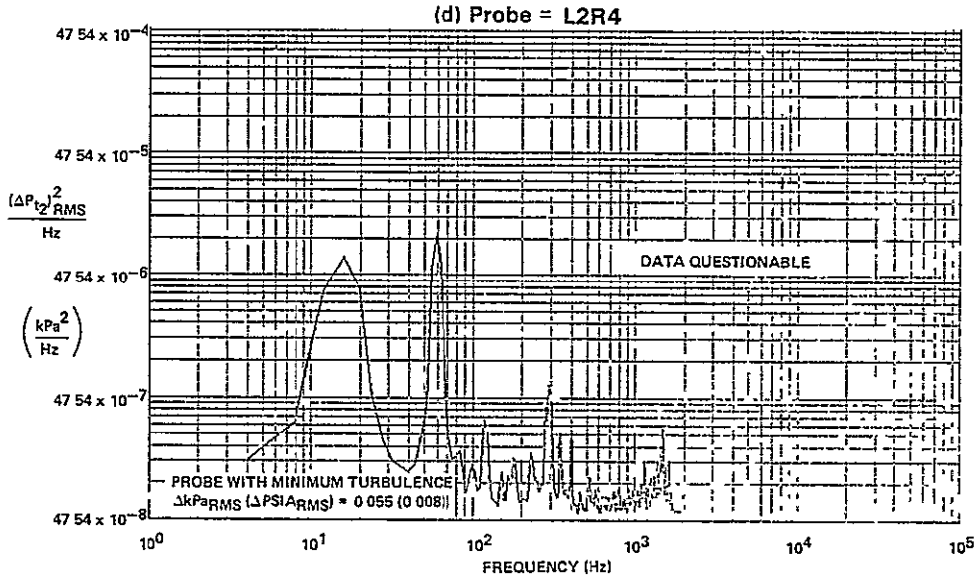


FIGURE D-37 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.2$, $\alpha = 11$, $\beta = 0$, WAT2 = 59.0%

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FSE - NASA DATA STUDY

DATA PART/POINT 549/8 IDENT 78 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 05 42 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	11	0	6 8	24 8	0677 (105 0)	59 8%	–25 0

1 PSIA = 6 8948 kPa

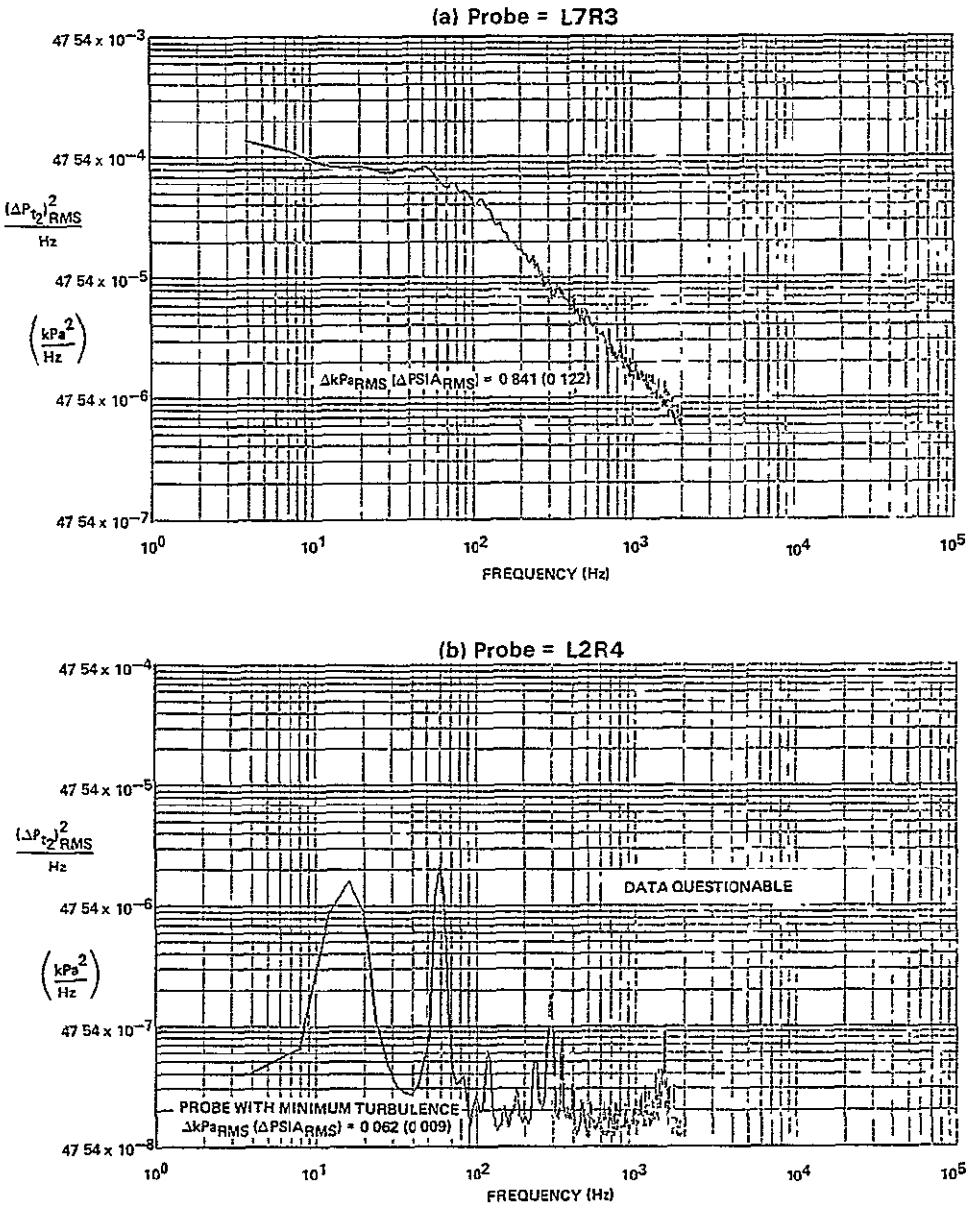


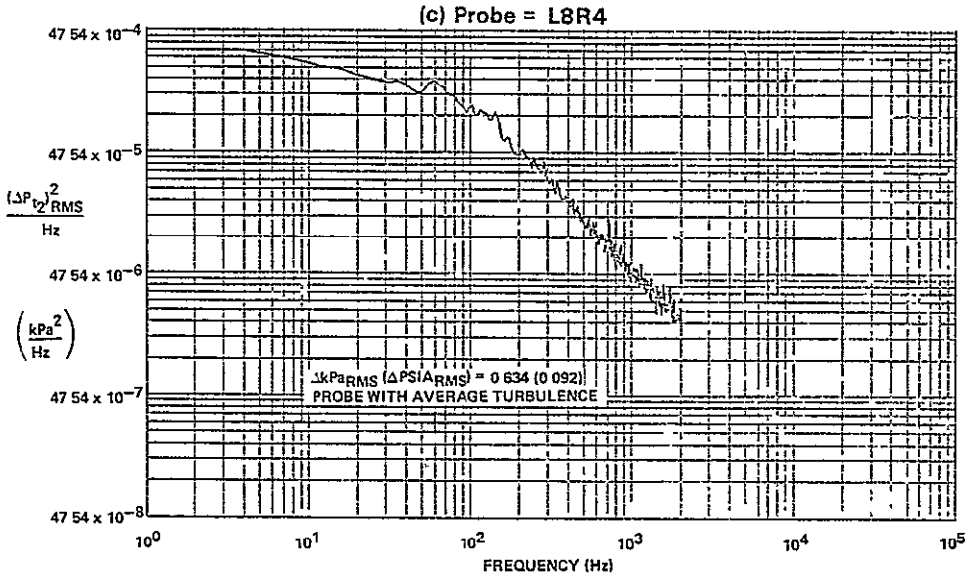
FIGURE D-38
POWER SPECTRAL DENSITY PLOTS FOR
M_O = 2.2, α = 11, β = 0, WAT2 = 59.8%

FSE - NASA DATA STUDY

DATA PART/POINT 549/8 IDENT 78 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 01 05 42 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 2	11	0	6 8	24 8	0677 (105 0)	59 8%	—25 0

1 PSIA = 6 8948 kPa



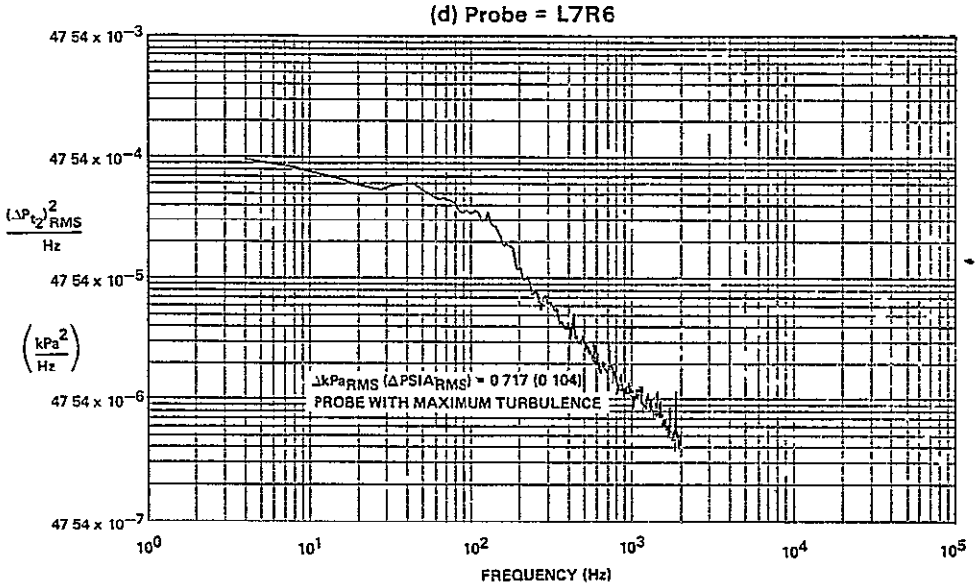


FIGURE D-38 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.2, α = 11, β = 0, WAT2 = 59.8%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 227/7 IDENT 79 FREQUENCY RANGE = 6 - 2024 Hz
THE SEGMENT START TIME WAS AT 20 27 47 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	BHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0774 (120 0)	63 1%	−25 0

1 PSIA = 6 8948 kPa

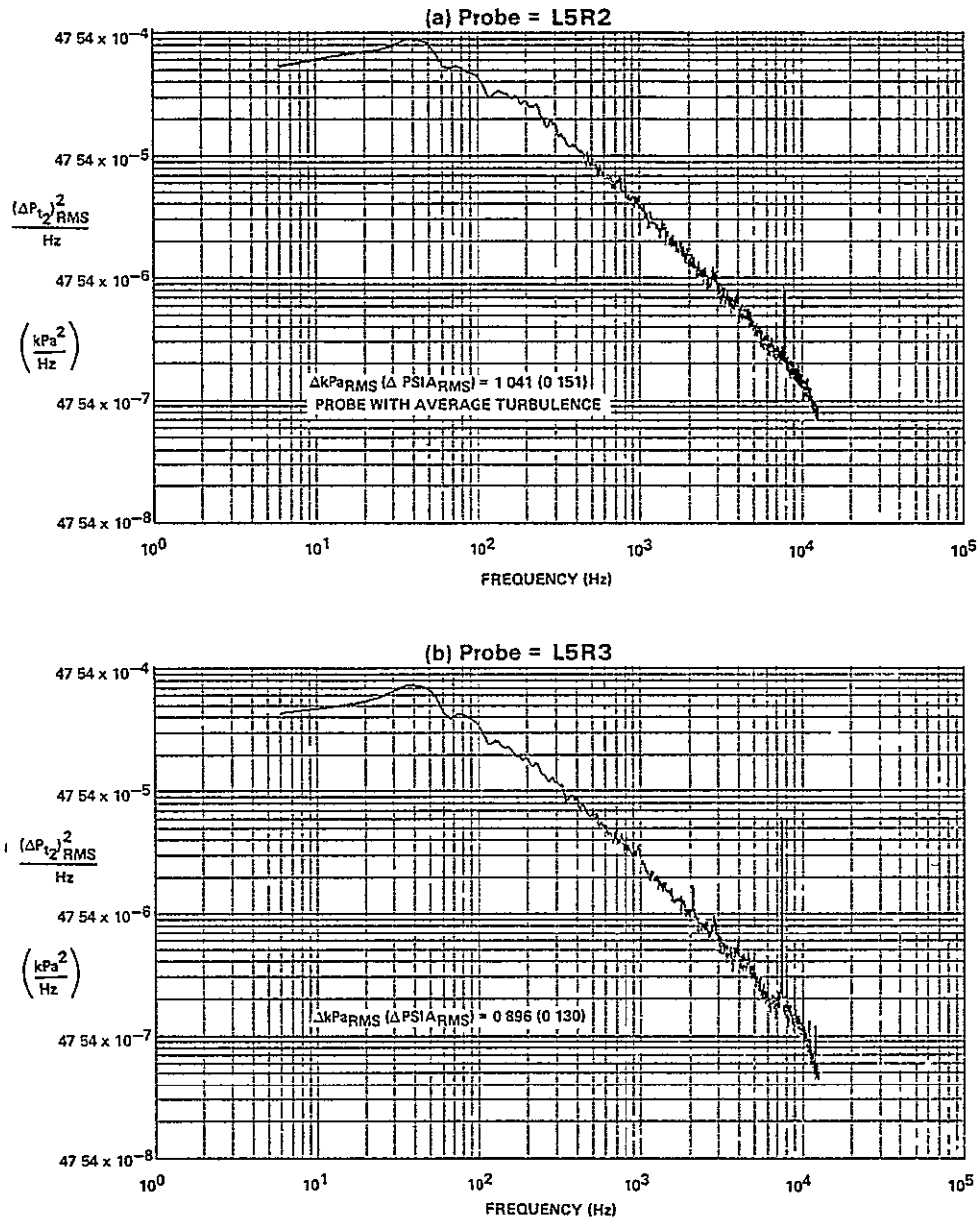


FIGURE D-39
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.5$, $\alpha = 0$, $\beta = 0$, WAT2 = 63.1%

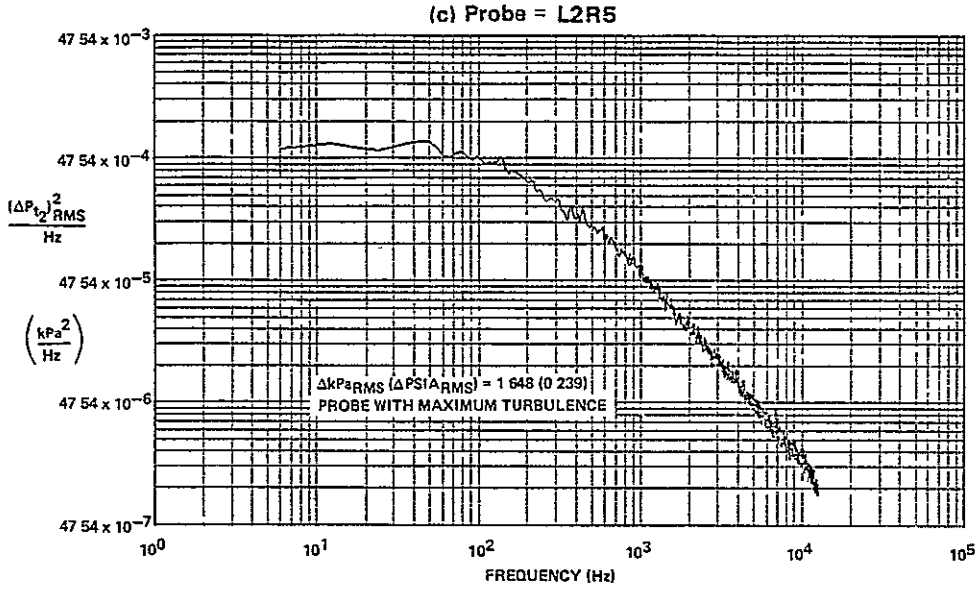
SERIES VIII - NASA DATA STUDY

DATA PART/POINT 227/7 IDENT 79 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 27 47 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0774 (120 0)	63 1%	−25 0

1 PSIA = 6 8948 kPa

(c) Probe = L2R5



(d) Probe = L7R6

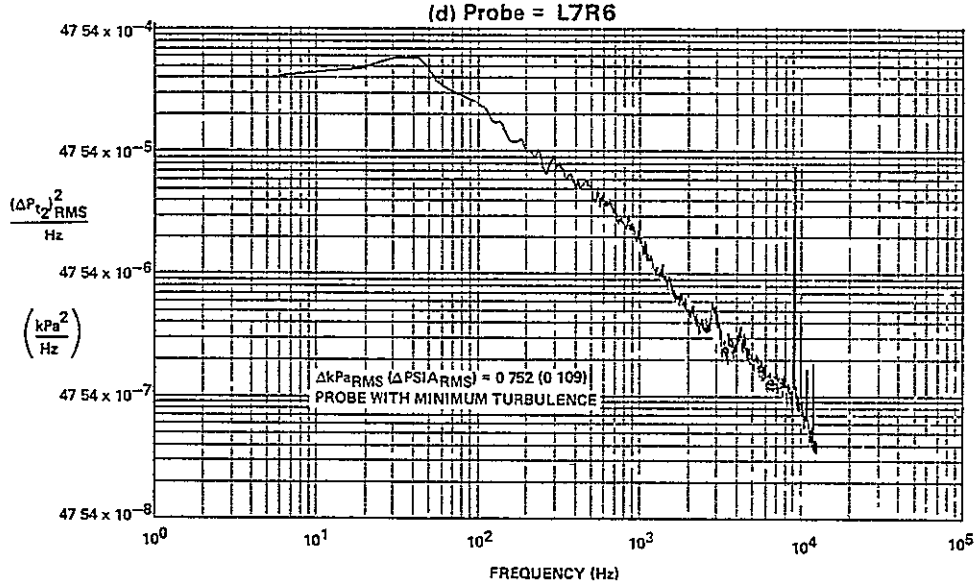


FIGURE D-39 (Contiued)
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.5$, $\alpha = 0$, $\beta = 0$, WAT2 = 63.1%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 227/5 IDENT 80 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 25 49 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0774 (120 0)	68 2%	−25 0

1 PSIA = 6 8948 kPa

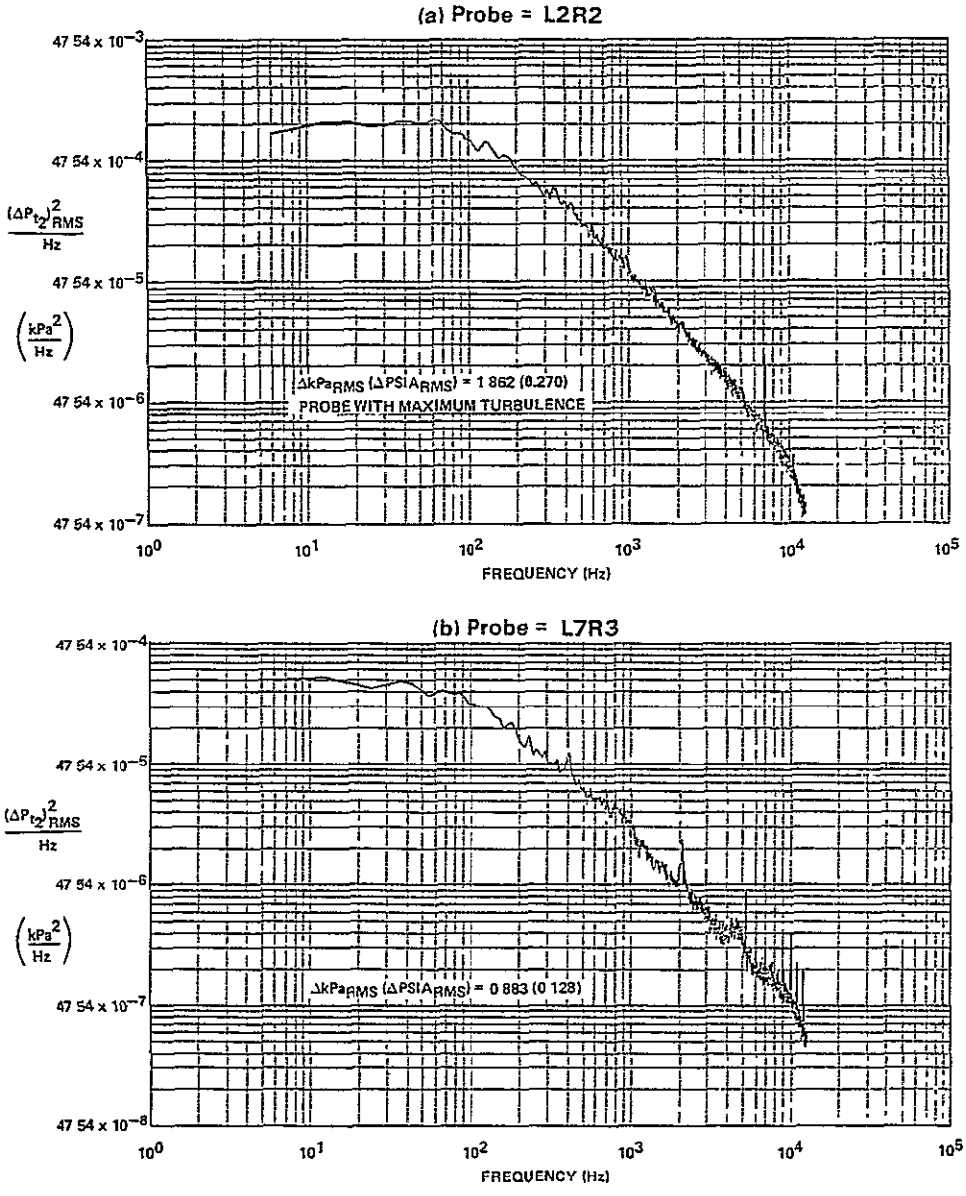


FIGURE D-40
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.5$, $\alpha = 0$, $\beta = 0$, WAT2 = 68.2%

SERIES VIII - NASA DATA STUDY

DATA PART/POINT 227/5 IDENT 80 FREQUENCY RANGE = 6-12000 Hz
THE SEGMENT START TIME WAS AT 20 25 49 000
BANDWIDTH = 12 2 Hz RECORD LENGTH = 10 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0774 (120 0)	68 2%	−25 0

1 PSIA = 6 8948 kPa

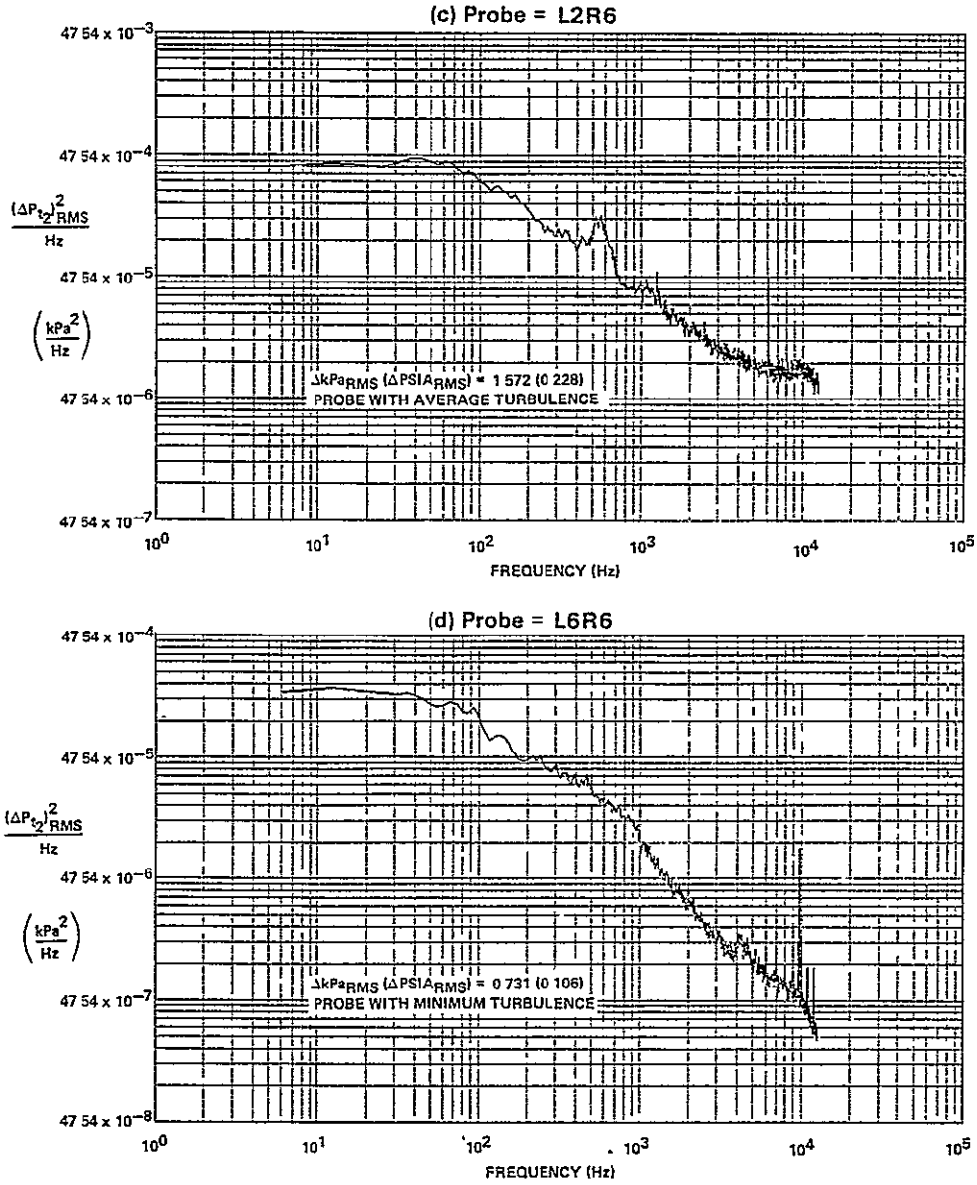


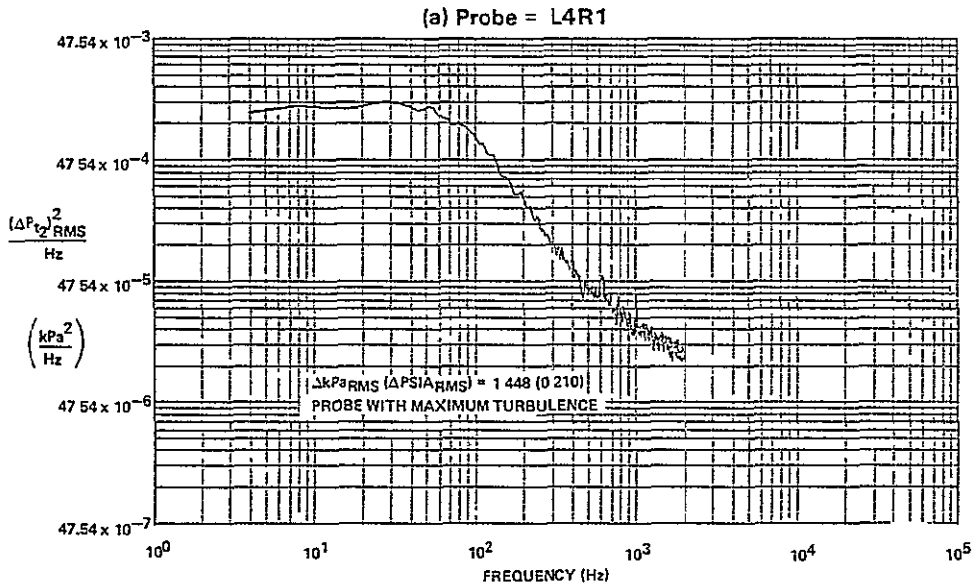
FIGURE D-40 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 2.5, α = 0, β = 0, WAT2 = 68.2%

FSCP - NASA DATA STUDY

DATA PART/POINT 465/8 IDENT 81 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 03 23 40 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0781 (121 0)	62 8%	−25 0

1 PSIA = 6 8948 kPa



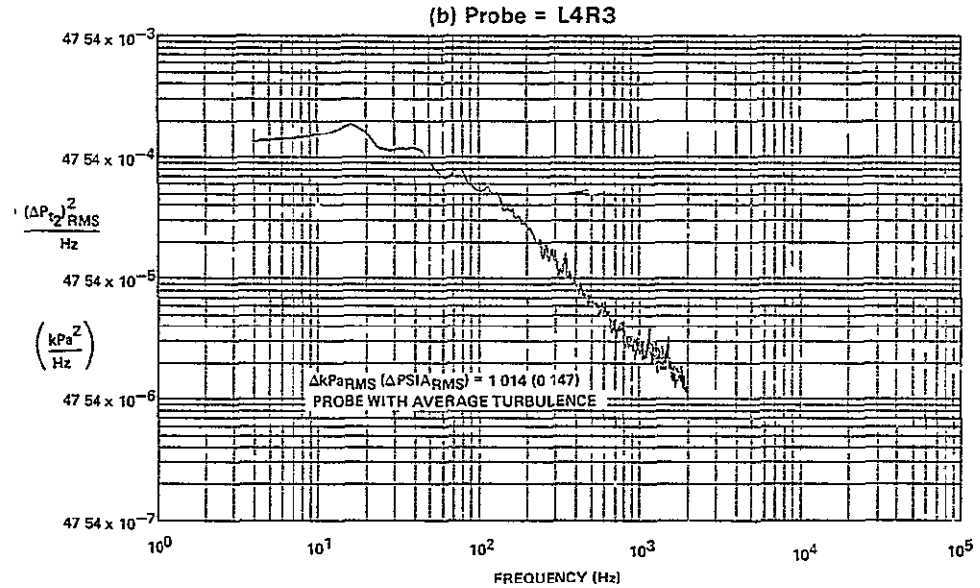


FIGURE D-41
POWER SPECTRAL DENSITY PLOTS FOR
$M_O = 2.5$, $\alpha = 0$, $\beta = 0$, WAT2 = 62.8%

C-2

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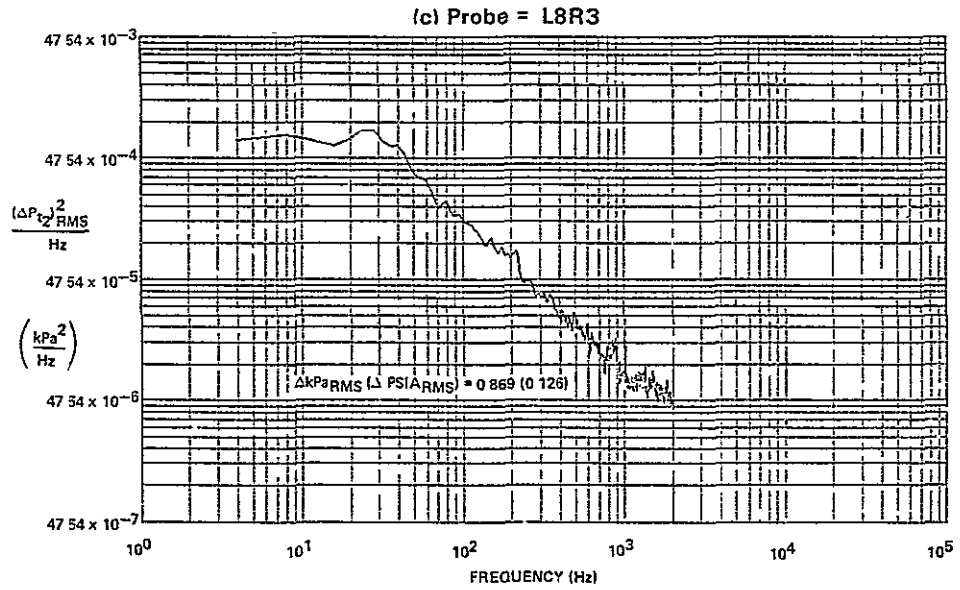
FSCP - NASA DATA STUDY

DATA PART/POINT 465/8 IDENT 81 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 03 23 40 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0781 (121 0)	62 8%	−25 0

1 PSIA = 6 8948 kPa



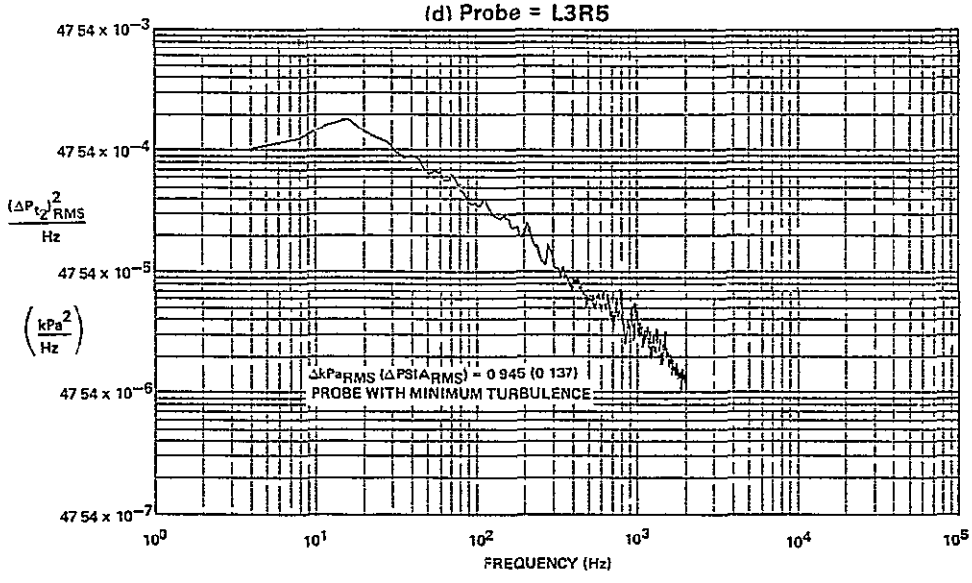


FIGURE D-41 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_0 = 2.5, α = 0, β = 0, WAT2 = 62.8%

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FSCP - NASA DATA STUDY

DATA PART/POINT 465/5 IDENT 82 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 03 21 04 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	—4 0	26 0	0781 (121 0)	68 9%	—25 0

1 PSIA = 6 8948 kPa

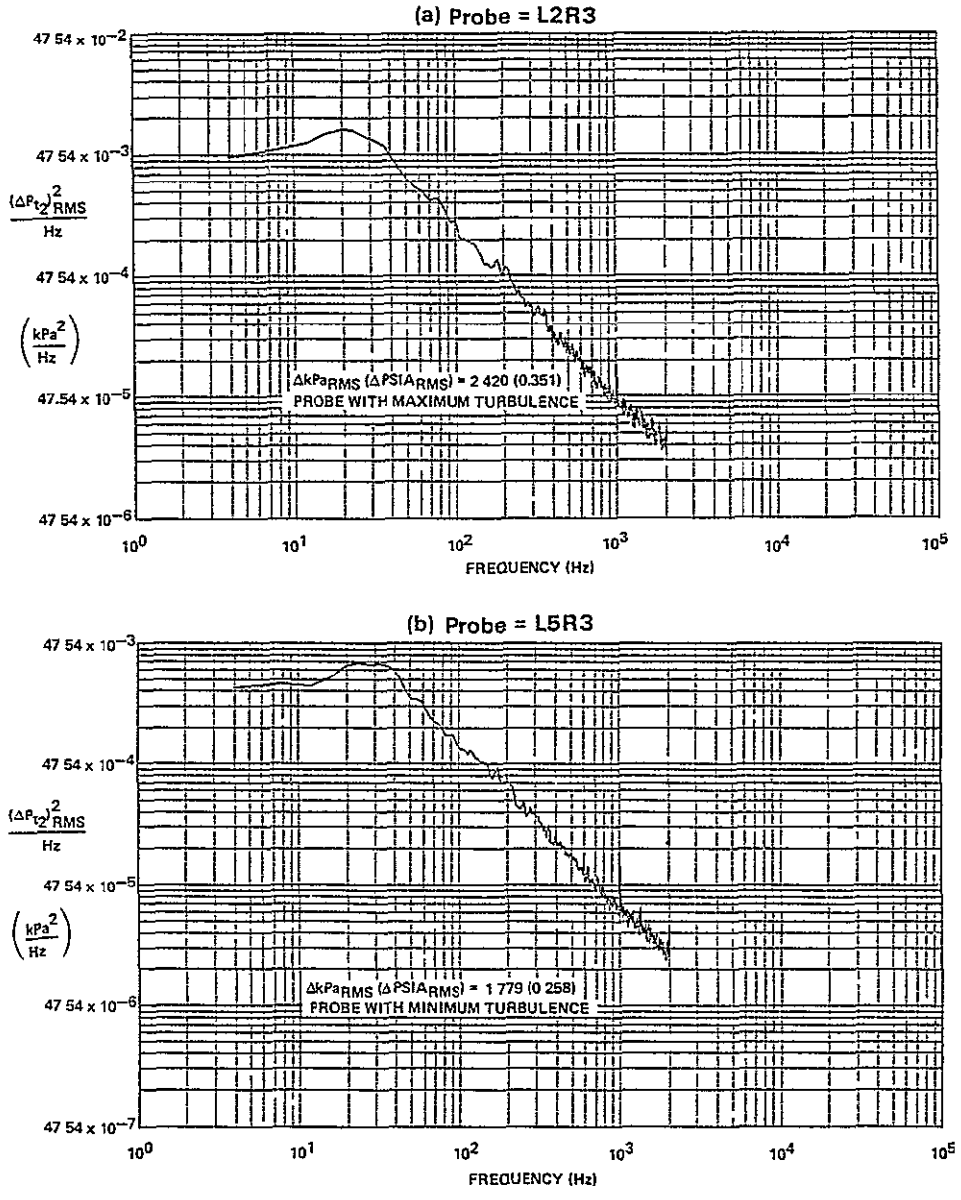

FIGURE D-42
POWER SPECTRAL DENSITY PLOTS FOR
$M_o = 2.5$, $\alpha = 0$, $\beta = 0$, WAT2 = 68.9%

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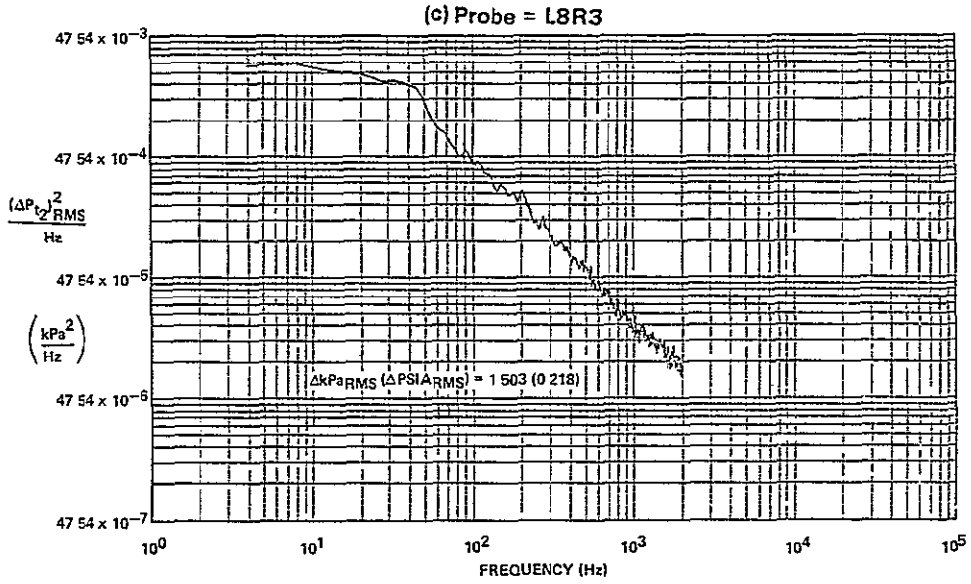
FSCP - NASA DATA STUDY

DATA PART/POINT 465/5 IDENT 82 FREQUENCY RANGE = 4 - 2024 Hz
THE SEGMENT START TIME WAS AT 03 21 04 000
BANDWIDTH = 7 9 Hz RECORD LENGTH = 13 0 SECONDS

MACH	ALPHA	BETA	RHO	DELTA3	BYPASS	WAT2	CIVV
2 5	0	0	−4 0	26 0	0781 (121 0)	68 9%	−25 0

1 PSIA = 6 8948 kPa

(c) Probe = L8R3



(d) Probe = L1R6

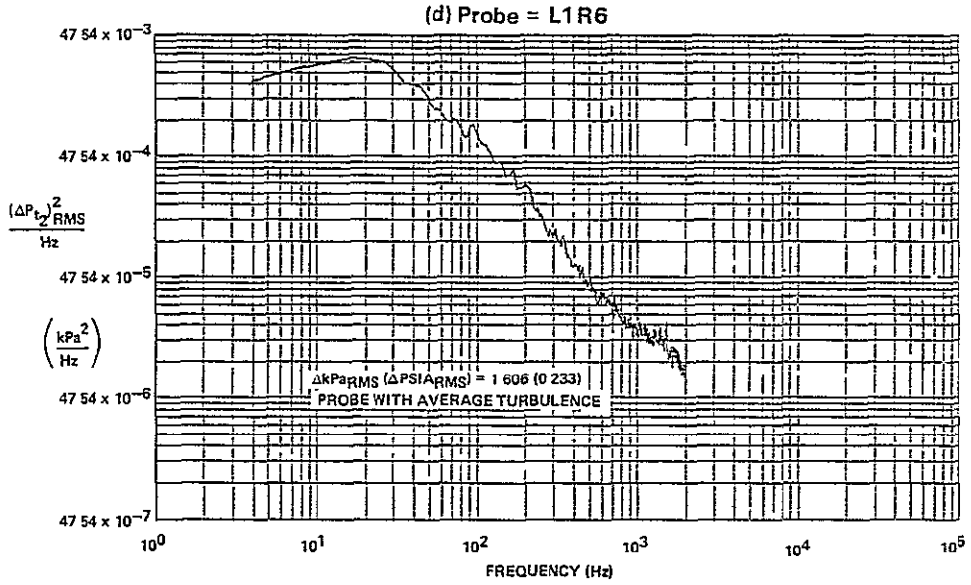


FIGURE D-42 (Continued)
POWER SPECTRAL DENSITY PLOTS FOR
M_o = 2.5, α = 0, β = 0, WAT2 = 68.9%

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